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An Introduction to Commercial Fishing Gear and Methods Used in Scotland

E S Strange

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An Introduction to Commercial Fishing Gear and Methods Used in Scotland

E S Strange

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Introduction

In early times man hunted fish to supply food for his family and himself, fishing from the sea shore or river bank, using spears, crude hooks and lines, and simple traps. When he took to the water in the first rough dugouts, his field of operations was extended, and as the pattern of community living developed fish became not only food for the catcher but a commodity to trade. Competition slowly led to innovation and improvements in fishing gear and methods to suit different species and the resources of the catcher.

Today there is a wide range of towed fishing gear for catching fish in mid-water, on the bottom or just off the bottom and suitable for small and large vessels working singly or in pairs. There are various types of seines used for surrounding large shoals of fish in open water or small shoals near the coast, static nets that catch fish by enmeshing them, traps for crabs, lobsters, salmon and sea trout, dredges for scallops and queens, great and small lines for catching fish on baited hooks and a variety of hand line fishing tackle.

For those who for professional reasons need to know something about fishing gear and methods used today, or those who simply would like to know about the gear and methods used to catch their fish, this booklet is offered as an introduction.

The main types of fishing gear used by Scottish fishermen, and the species for which they are used, are listed in the next section. References to the published literature are omitted from the text, and instead are appended as a 'Reading List' on p.34.

Fishing Methods for Commercially Important Species - Summary

For Whitefish - cod, haddock, whiting, skate, flatfish, etc.
- Bottom trawling
- Pair-trawling
- Seine-netting
- Great lines - mainly halibut, tusk, ling, skate, cod
- Small lines
- Hand lines - mainly codling, haddock, whiting
- Set nets - mainly for codling in shallow water

For Pelagic Fish - herring, sprats, mackerel
- Single-boat pelagic trawling
- Pelagic pair-trawling
- Purse-seining - mainly for herring and mackerel
- Ring-netting - mainly for herring
- Drift-netting - mainly for herring

For Migrating Game Fish - salmon, sea trout
- Pound nets
- Beach-seine

For Shellfish

Bottom trawling - Norway lobsters, shrimps, squid
Beam trawling - shrimps
Dredging - scallops, queens
Creeling - lobsters, Norway lobsters, crabs

Trawling

Trawling is the operation of towing a net to catch fish, and the basic requirements for operating the trawl net are power to tow the net, a means of holding the mouth of the net open while towing, a system of wires to connect the net and gear to the source of towing power and the ability to cast and haul the net.

Vessels provide the necessary towing power, from quite small boats up to large 3,000 hp freezer stern trawlers, with size of gear to suit the available towing power. They may be designed to tow the fishing gear either from the side or from the stern. They also provide accommodation for the crew, transportation to and from the fishing grounds, and a working platform for fishing operations. Winches installed on deck move and hold the trawling wires. Auxiliary winches and sundry lifting tackle are provided to assist with handling gear at the vessel.

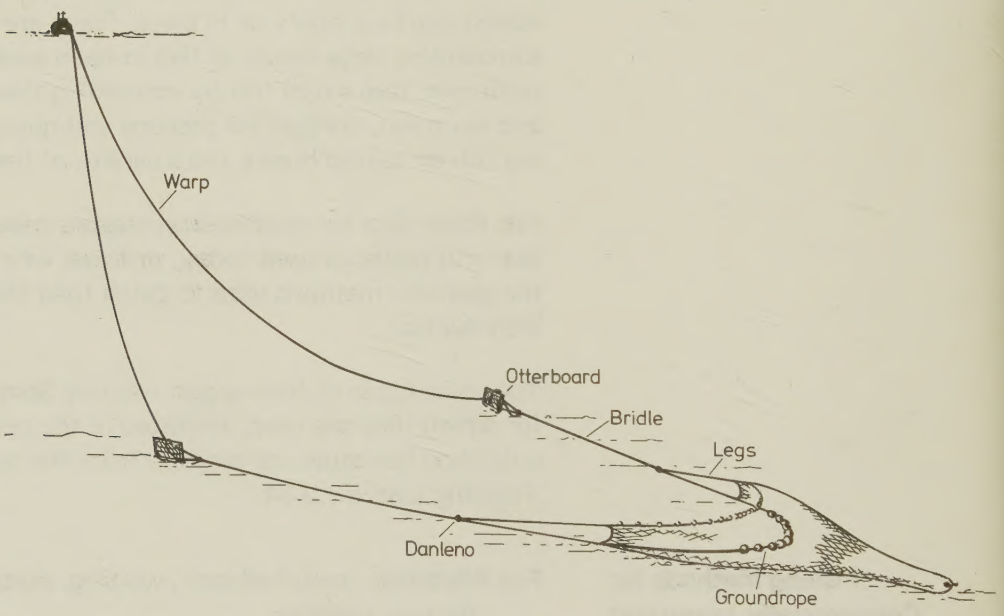


Figure 1. The principal features of a trawl gear.

The net may be towed over the sea bed (Fig 1) or at any depth in mid-water according to the species sought, by one or two vessels. In single-boat trawling otterboards are used to spread the connecting wires and hence hold the net open horizontally. In two-boat trawling the wires connecting each vessel to the net are held open horizontally by the vessels keeping station some distance apart when towing.

Floats, usually spherical and made of material to withstand implosion at maximum fishing depth, are attached to the headline along the top of the net mouth to hold it up, whilst weight is distributed along the groundrope at the bottom edge to hold it down.

The Trawl Gear

All trawl nets, large and small, for both bottom and mid-water trawling, are basically funnel shaped, with their sides extended in front to form wings to prevent fish disturbed in front of the net from escaping. They may comprise two panels, top and bottom, or four panels, top, bottom and sides. Trawls for bottom fishing have a top canopy, called the square, extending forward

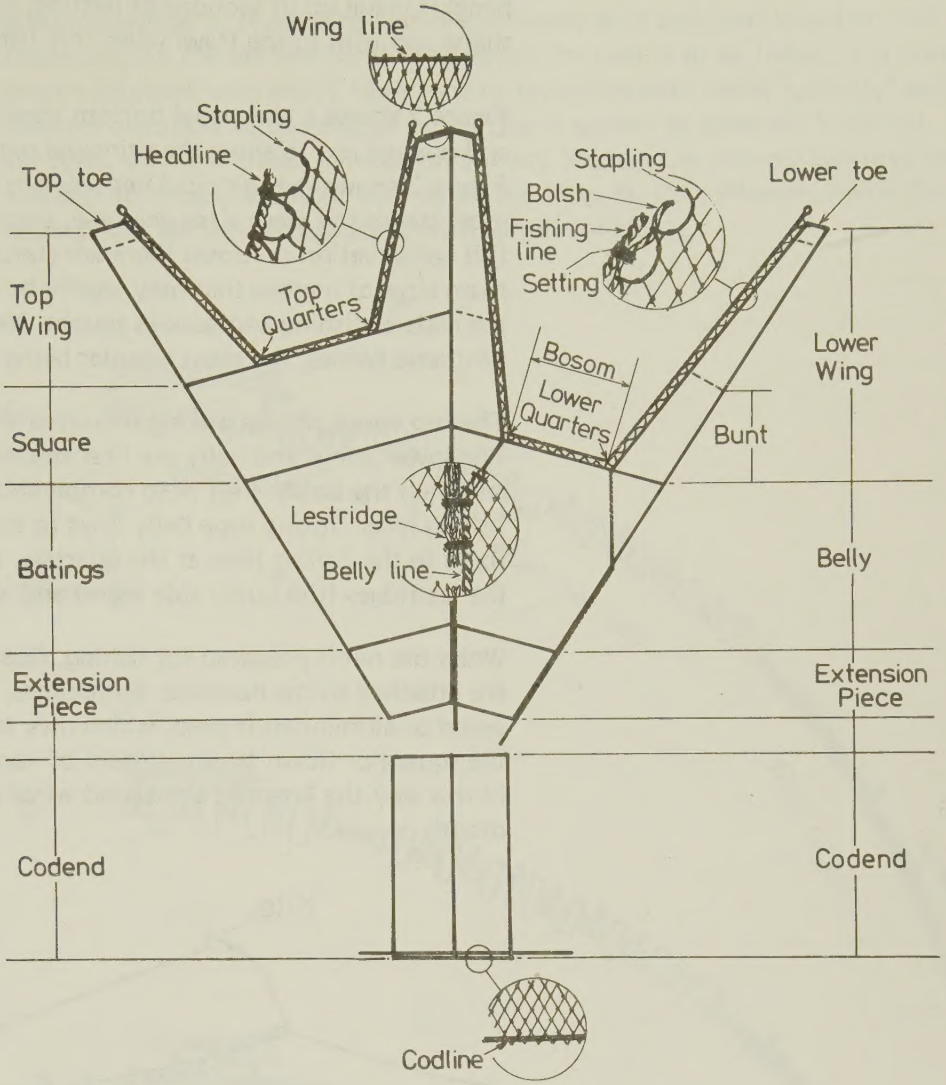


Figure 2. The principal net sections and ropes of a two-panel trawl.

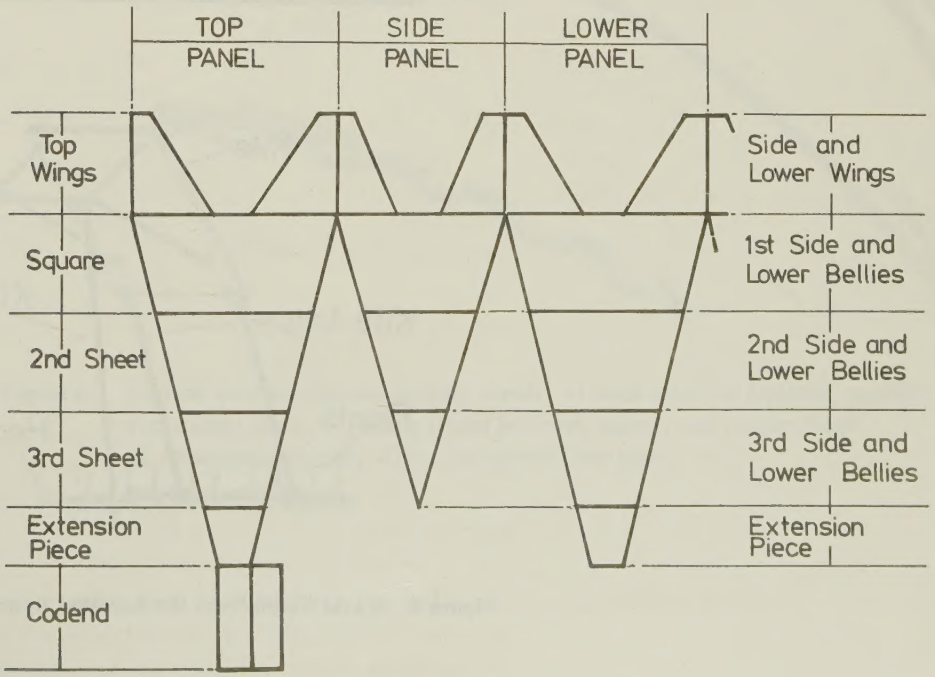


Figure 3. The main sections of a four-panel mid-water trawl.

from the funnel to prevent fish from escaping over the top of the net. Each panel is made up of sections of netting, suitably tailored to give the required shape and trim to the trawl when it is fishing.

Figure 2 shows a two-panel bottom trawl that has been unlaced at one side and opened out to show the principal net sections and ropes of both panels. Figure 3 shows the principal net sections of a four-panel mid-water trawl. In most trawls the mesh sizes decrease, section by section, to the codend. For fish conservation purposes there are statutory regulations which set the minimum sizes of meshes that may legally be used for fishing nets according to the class of fishing and species sought. Nearly all trawls are now made of synthetic twines, the most popular being nylon and polyethylene.

The top wings and square are mounted to a stout rope called the headline. The lower wings and belly are first stapled to a soft-laid rope called a bolsh and then the bolsh is set onto combination wire and fibre rope called the fishing lines. Strong rope belly lines to strengthen the body of the net are fixed to the fishing lines at the quarters, reach diagonally across the belly to the lestridges (the bulky side seam) and along the lestridges to the codend.

When the net is prepared for fishing, floats made of plastic or aluminium alloy are attached to the headline. Sometimes, to provide extra lift, a kite made of wood or aluminium is sued, which may be attached directly to the front of the square or flown from a system of connecting wires (Fig 4). When rigged in this way the kite and associated wires may direct fish down to the net mouth.

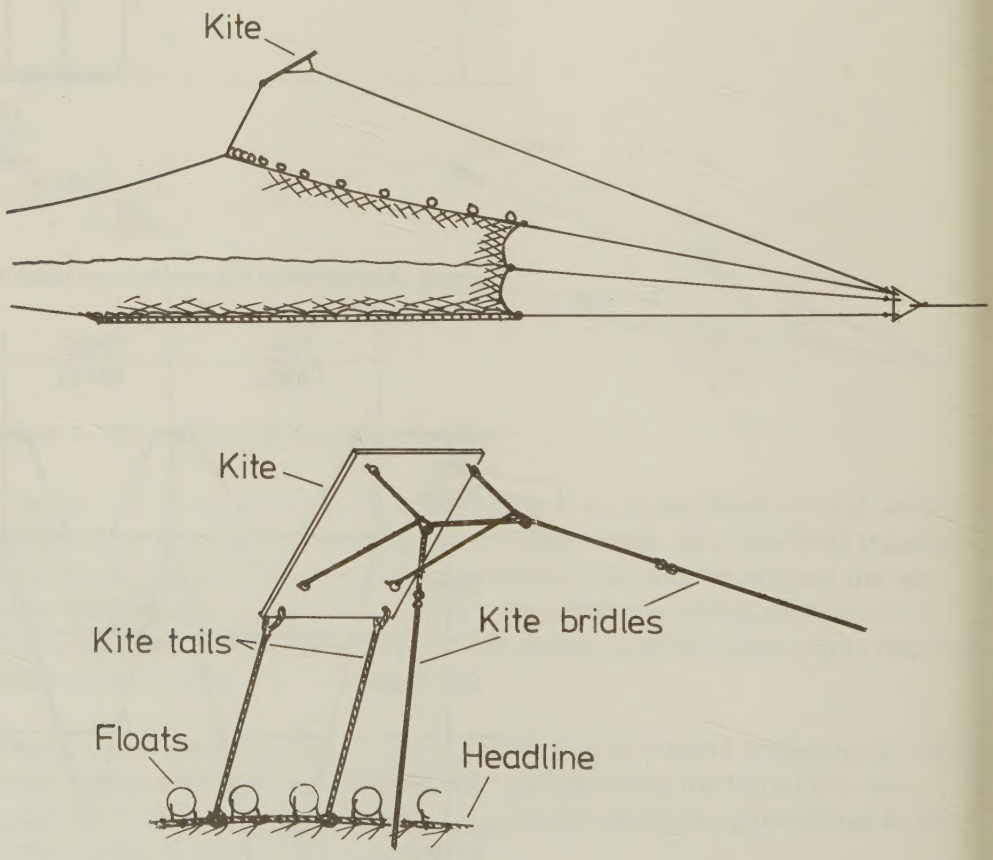


Figure 4. A kite flown from the headline to provide extra lift.

The fishing lines of bottom trawls are attached to a groundrope, which holds the bottom of the net mouth down and protects the netting in this area from ground damage. It is made of sections of heavy wire shackled together, and depending on the sea bed conditions where the gear is to be fished, it is either simply rounded with heavy fibre rope or furbished with heavy spherical steel bobbins or rubber wheel-shaped bobbins and spacers or discs cut from old car tyres. On light trawls worked on a sandy bottom the groundrope may be a heavy fibre rope weighted with lead rings (Fig. 5). On midwater trawls the fishing lines are usually weighted with lengths of chain.

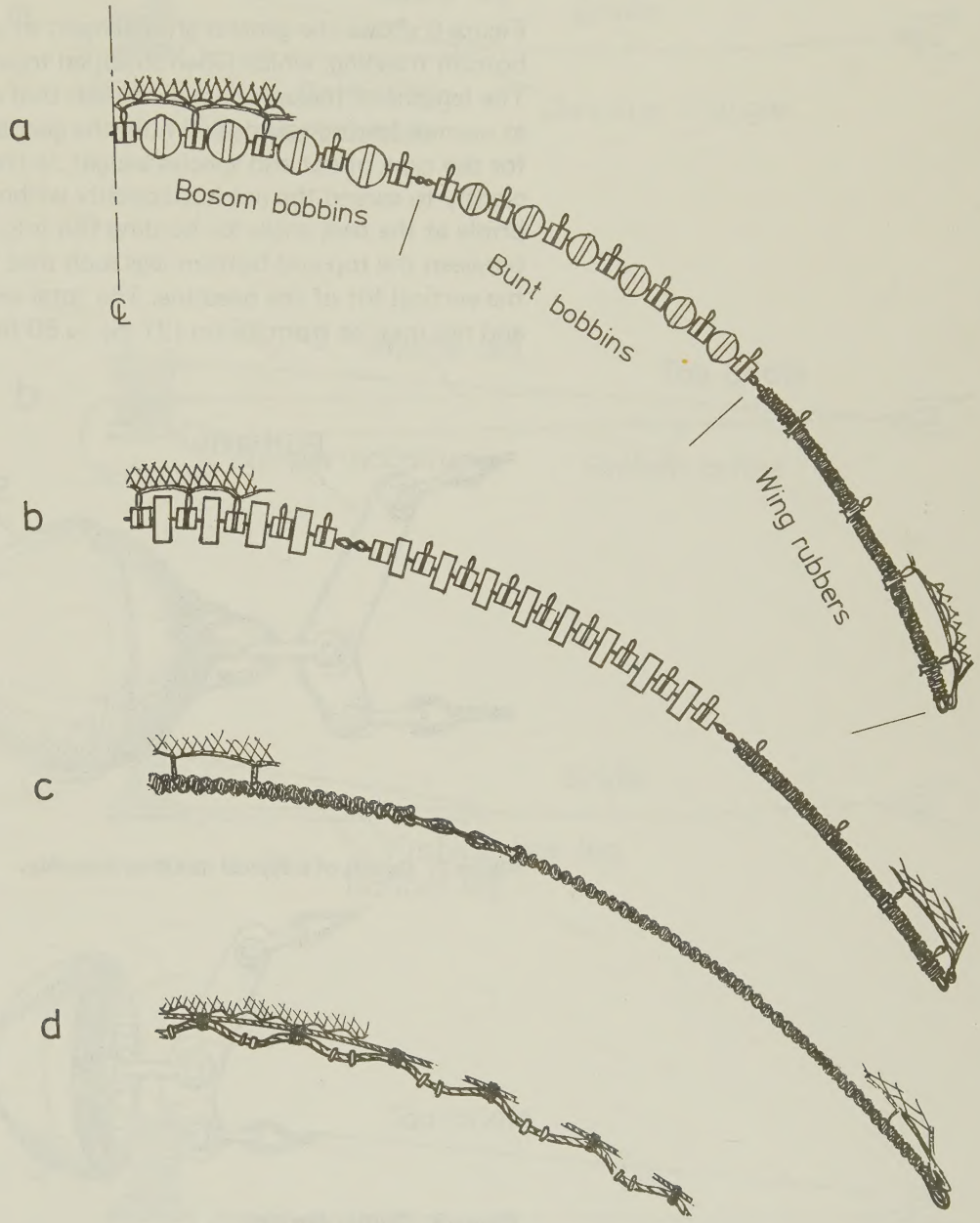


Figure 5. **Typical groundropes for bottom trawls: a) steel spherical bobbins, spacers and rubber discs; b) rubber wheel bobbins, spacers and rubber discs; c) rope-rounded wire; d) lead-weighted fibre rope.**

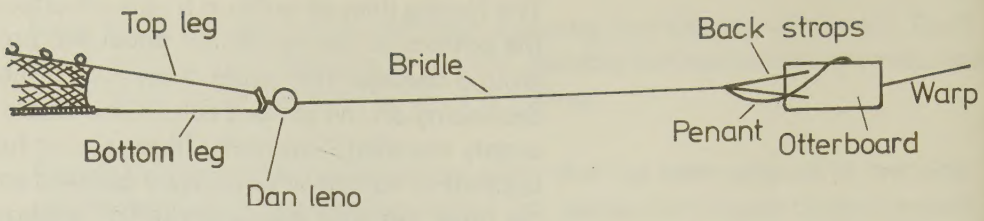


Figure 6. The general arrangement of wires and hardware for single boat bottom trawling.

Figure 6 shows the general arrangement of wires and hardware for single-boat bottom trawling, which when shackled together connect the net to the ship. The lengths of the wires are so chosen that all the forces transmitted in them at normal towing speeds will hold the gear at the best fishing configuration for the type of net and species sought, ie the otterboards separated sufficiently to spread the net horizontally without sacrifice of vertical spread, the bridle at the best angle for herding fish into the path of the net, and the angle between the top and bottom legs such that the top leg does not over-constrain the vertical lift of the headline. The total length of wire between otterboard and net may be from 15 fm (27 m) to 60 fm (110 m).

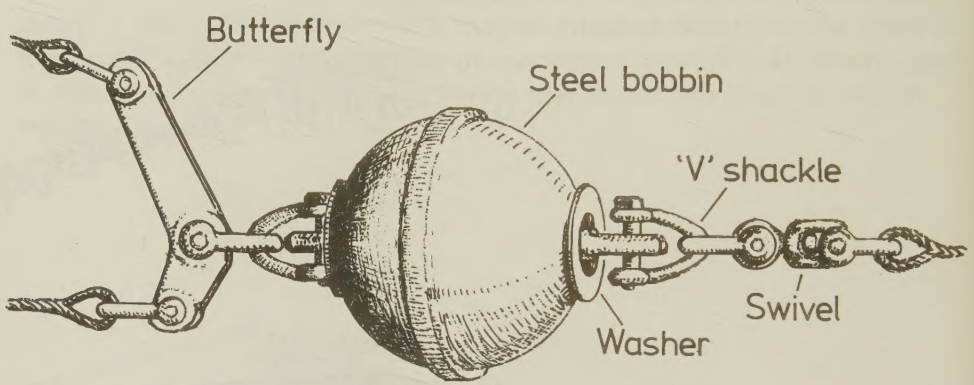


Figure 7. Details of a typical dan leno assembly.

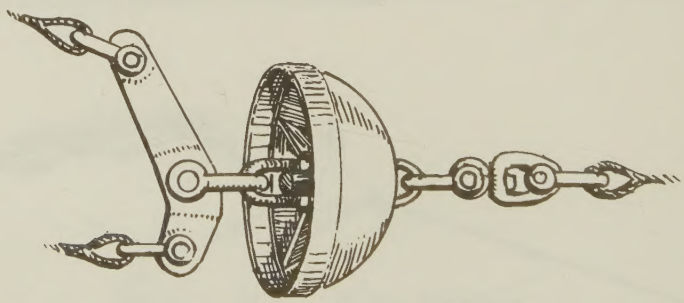
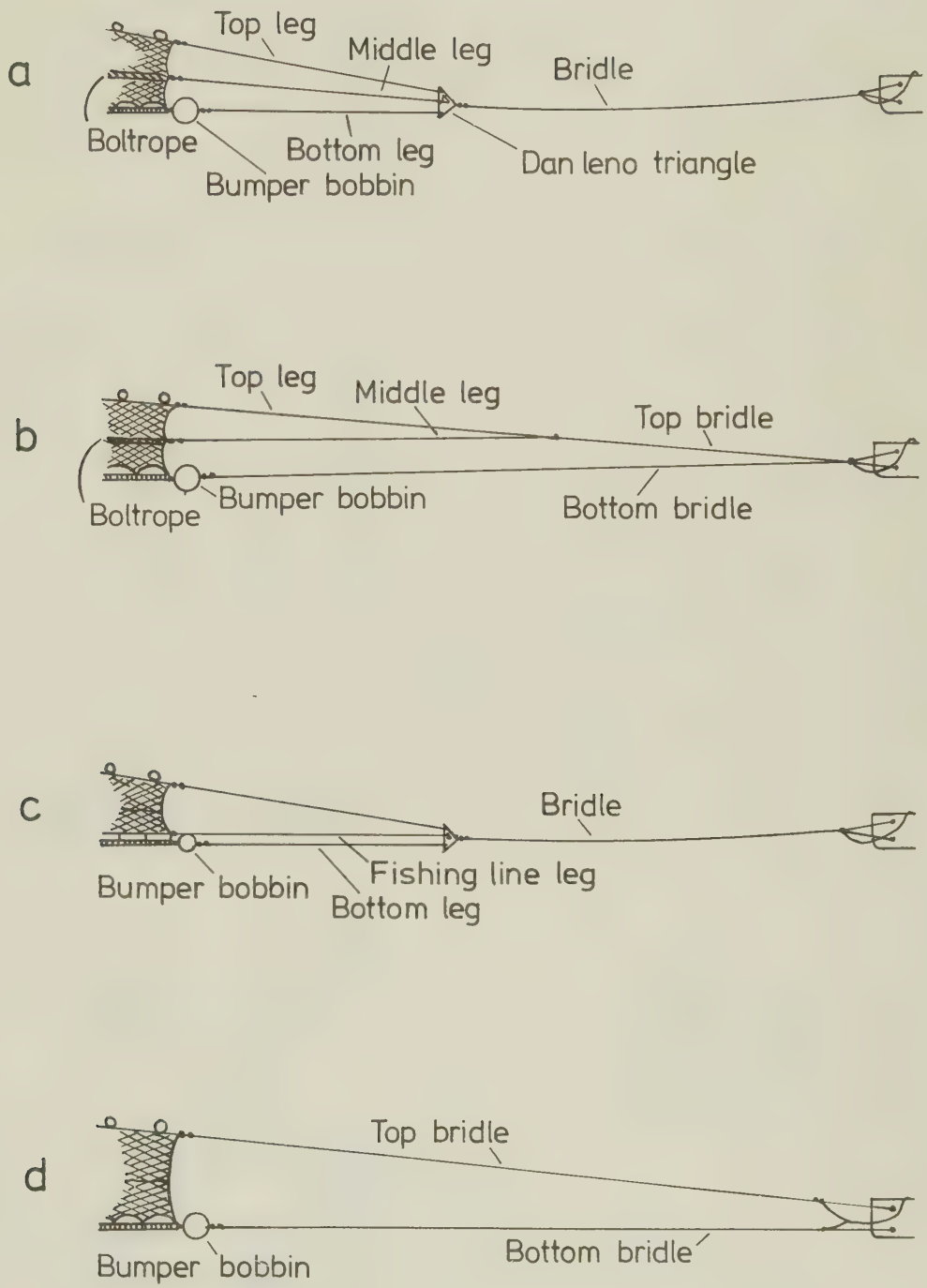


Figure 8. Skuttle dan leno.

The dan leno shown in Figure 7 helps to hold the gear at this point close to the sea bed and to spread the wing end vertically. The butterfly also adjusts itself to compensate for small fluctuations of tension in the legs. An alternative dan leno that employs a light hemispherical skuttle bobbin is shown in Figure 8.

For high headline nets the rig may be modified and include a middle leg, with or without a dan leno, or two bridles connected directly between the otterboards. Figures 9 and 10 show alternative wire systems for bottom trawling and mid-water trawling.



Page 7, fig. 9, Caption should read:
"Some alternative rigging systems for bottom trawling:—
a) and b) boltrope rigs; c) with fishing line leg; d) twin bridles."

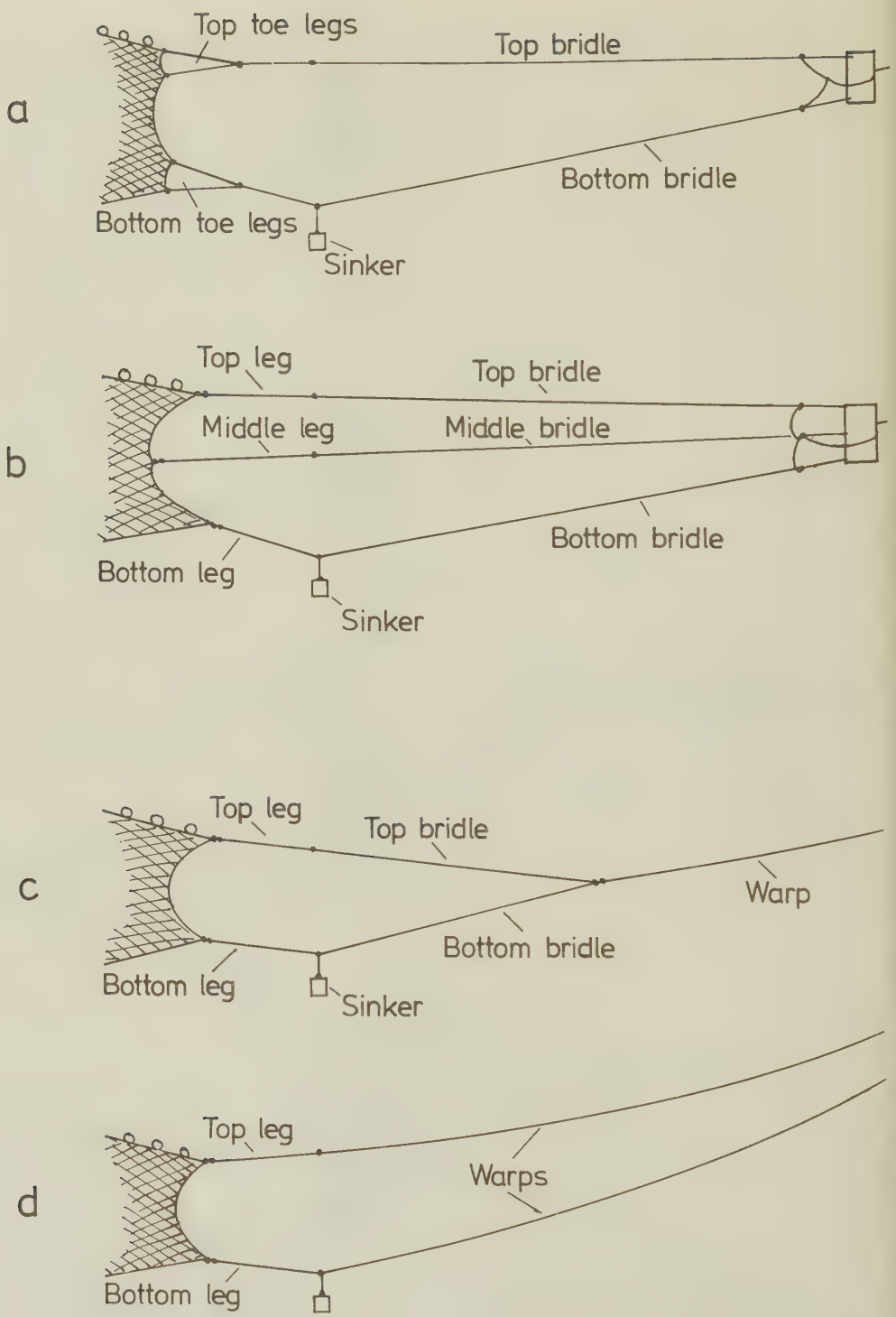


Figure 10. Some alternative rigging systems for pelagic trawling:-
a) and b) twin- and three-bridle systems for single-boat pelagic trawling;
c) and d) single- and two-warp systems for pelagic pair-trawling.

Some types of otterboards used to spread the gear are shown in Figure 11. The traditional wood and steel flat otterboards are still widely used for bottom trawling. They range in size from 0.28 m^2 (3 sq ft) to 6.5 m^2 (70 sq ft), and depending on their size may be of simple construction or ruggedly constructed of stout oak or elm timbers bound and strapped with iron bars, and have steel plates fastened to the back and front of the lower planks to protect them from chafing and a heavy steel keel bolted or welded to the bottom edge. An out-posted connecting point for the warp from the ship is provided by two triangular towing brackets together. Two large "U" bolts or rings are bolted onto the back of the otterboard, to which the back strops are shackled. The positions of these connecting points are chosen so that the otterboard adopts the best angle of attack to the towing direction for maximum spreading efficiency.

"V" boards are made of all steel and used mainly on near water fishing vessels of up to about 80 ft (24 m) length. Although cambered boards are frequently used on research vessels, they are not often found on commercial fishing boats. The all-steel high-aspect ratio Suberkrub boards are specifically for mid-water trawling. The very heavy wood and steel oval boards are used on larger trawlers mainly for bottom fishing.

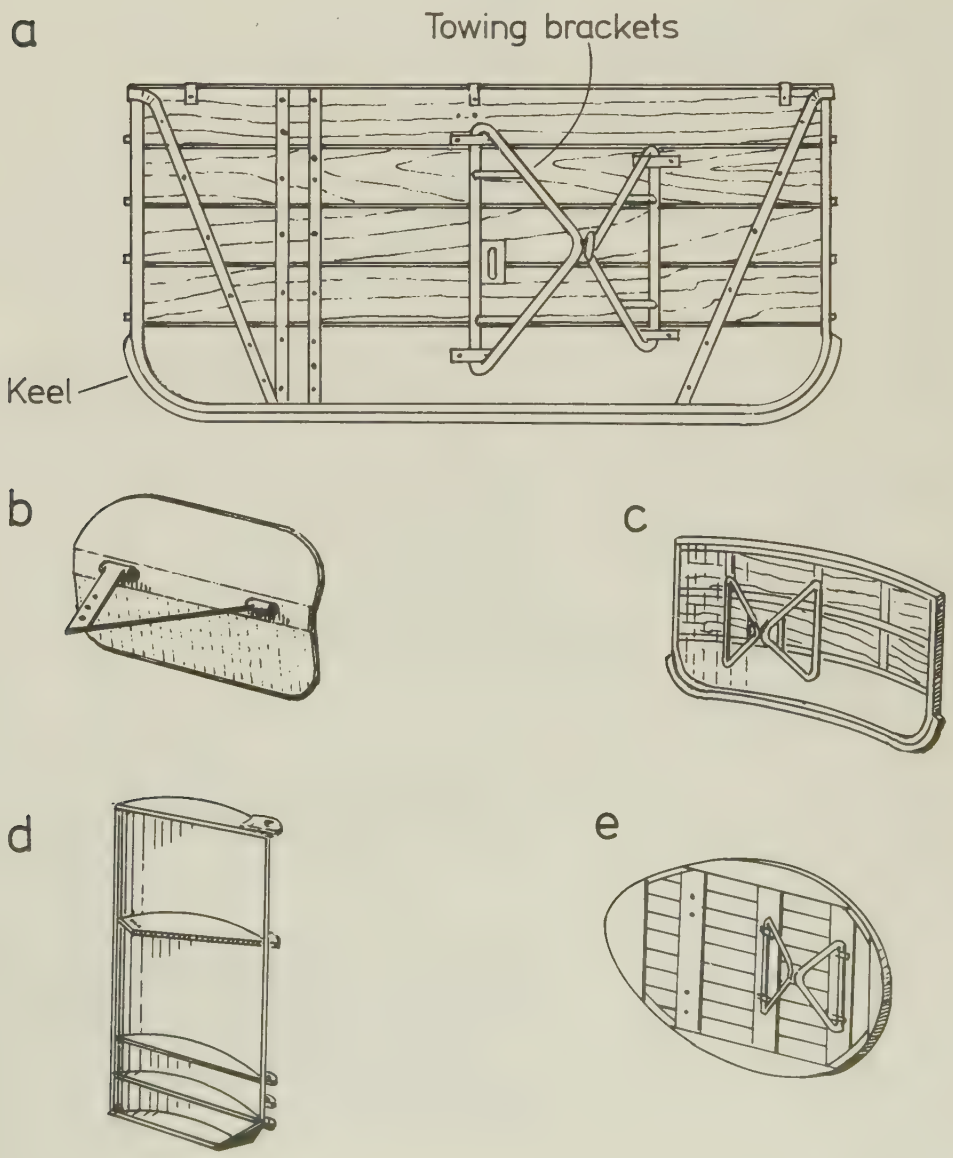


Figure 11. Types of otterboards - a) wood and steel flat otterboard; b) V-board; c) cambered otterboard; d) Suberkrub otterboards; e) oval otterboard.

Shooting and Hauling Trawl Gear

The amount of wire used each side of trawl gear varies from about 100 fm (180 m) on small inshore trawlers up to 1000 fm (1800 m) on large trawlers that fish in deep water. In order to reduce wear of these very expensive wires (warps) and to guide them from the winch to the towing points (on side trawlers the run of the wires between winch and towing point may change direction several times depending on the design of the vessel), the wires are guided round pulleys, with those at the towing points hung from gallows positioned fore and aft at the ship's side on side trawlers, or suitably elevated structures at each stern quarter on stern trawlers. Clearly it would not be feasible to pull otterboards and bobbins round pulleys and it would be time-consuming and often most hazardous to unshackle these items in turn in order to bring in successive parts of the gear. In practice, after the gear has been prepared at the beginning of a fishing period it is unnecessary to break the gear system until a replacement in the system is required. The ropes that are attached to the gear to facilitate shooting and hauling are shown in Figure 12, and in order more easily to understand their operation it is convenient to start with the towing condition and explain how the gear is hauled.

Figure 12a shows the wires associated with an otterboard when viewed from the back and Figure 12b shows the junction of the backstrops and the bridle in detail. Whilst the gear is being towed the drag of the net, bobbins etc at the other end of the bridle hold the figure-of-eight jammed into the kelly's eye. The leading end of the pennant is tied to a convenient position on the front of the otterboard and hangs slack.

When the gear is being hauled and the otterboards come up to the gallows, they are each made fast with chain through the brackets (chained up) and weight is taken off the warps. On side trawlers, the fore-end of each pennant is then untied, the warp disconnected from the brackets and the two ends shackled or clipped together. Hauling then recommences, the length of each bridle passing through its kelly's eye until the dan leno arrives at the ship.

Attached to each dan leno is a rope called a quarter rope (Fig. 12c), which runs through a becket on the headline, then round the outside of the net, and is fastened at its other end to the groundrope. When both dan lenos are secure at the ship, the quarter ropes are detached from them and hauled with the aid of the whipping drum on the winch to bring the groundrope bobbins up to the ship's side together with the headline. With the weight held by the quarter ropes made fast, other lifting tackle is brought into operation to lift the bobbins inboard. Netting is then hand-hauled until the cod-end arrives at the ship's side, when a sling is put round it and it is then lifted inboard and emptied onto the deck. Shooting of the gear is carried out in the reverse order.

If a large bag of fish has been caught it may be necessary to split the catch and make two or more lifts with the aid of the lazy deckie and double bag becket (Fig. 12c). As the lazy deckie is hauled and the becket tightens, the cod-end is strangled, separating off the catch in the cod-end from the rest of the catch until it is lowered empty over the side after the first lift to fill with more fish for the next lift, and so on until all the catch is safely on board.

On stern trawlers also a pennant system is used to transfer the weight of the gear behind the otterboards from or to hauling wires operated from auxiliary winches when shooting and hauling the gear, but with a greater clear reach from stern to winch compared with the often obstructed short reach across a side trawler, hauling of the dan lenos, bobbins, net and cod-end is accomplished more easily.

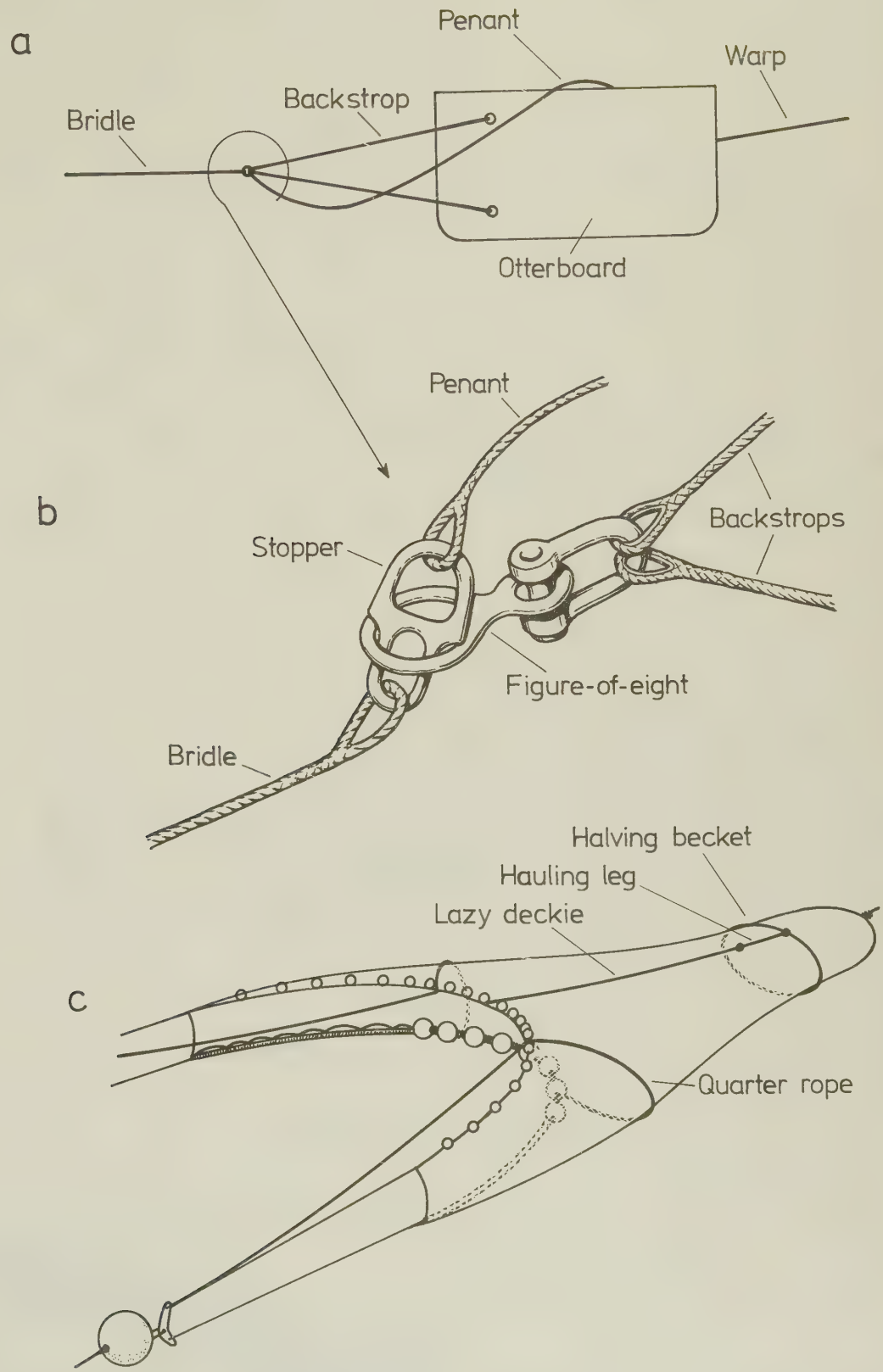


Figure 12. Auxiliary items for shooting and hauling trawl gear - a) the wires at the back of the otterboard; b) the junction of the backstrops and bridles; c) the hauling ropes on the net.

The Beam Trawl

The forerunner of the otter trawl was the beam trawl (Fig. 13), used in the days of sail fishing boats before the introduction of steam power for vessels and otterboards for spreading the net. It is still used in many parts of the world for catching shrimps and flatfish. Fairly large quantities of flatfish are caught by foreign beam trawlers in waters around Britain. It is sometimes used inshore by shrimp fishermen and by fisheries scientists for selective sampling of marine species. The beam (Fig. 13) may be made of wood or metal. It may be from 2 metres up to 8 metres long, and, depending on its length, it is made of two or three sections scarfed together. The trawl heads are made of iron and may be up to 1 metre high. The ground-rope may consist of small bobbins or rubber discs threaded on wire, or stout rope weighted with lead rings. The tickler chain routs out fish hiding just below the surface of the sand. (Tickler chains are sometimes used between the wings of bottom trawls and between the otterboards for the same purpose.)

A vessel may tow a single beam trawl from the stern, or two beam trawls, one from each side, depending on the size and design of the vessel. On vessels specially designed for beam trawling a pivoted derrick is provided on each side of the vessel from which, when they are lowered to out-rigged positions, two large beam trawls are towed.

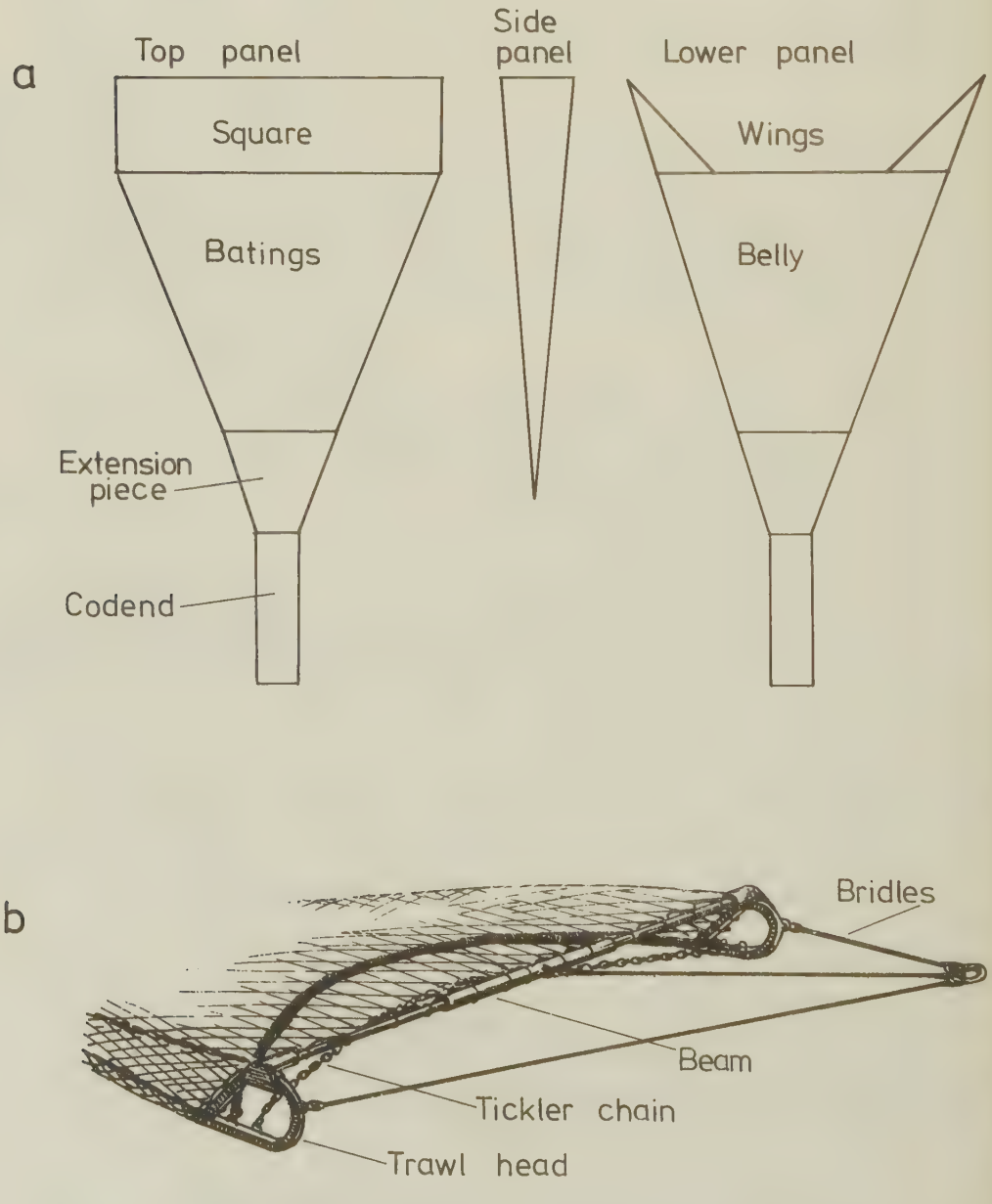


Figure 13. A beam trawl - a) the net panels; b) the net attached to the beam and trawl heads.

Seine-Netting

In seine-netting (Fig. 14) concentrations of fish on or close to the bottom are looked for and, when found, surrounded by two long lengths of rope with a net between their ends. The net is then slowly hauled back to the vessel.

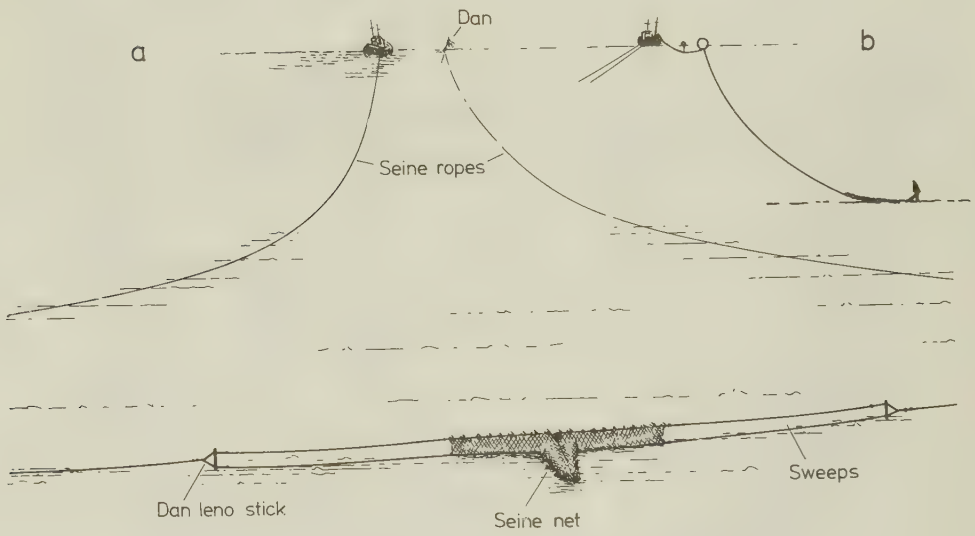


Figure 14. Shooting seine-net gear; a) fly-dragging; b) anchor seining.

The Seine-Net and Gear

Seine-netting was first introduced to Scotland in the early nineteen twenties. Unlike trawl nets, which have top and bottom panels with lestridges along the side (or four panels), the seine-net was constructed of two equal panels with the lestridges running down the centre line of the top and bottom of the net, each side having one wing, shoulder and bag sections (Fig. 15). Today many nets similar in design to trawl nets, having top and lower wings and side lestridges, as well as versions of the traditional seine-net are used for seine-netting. Many nets are dual purpose - seine-net/light trawl.

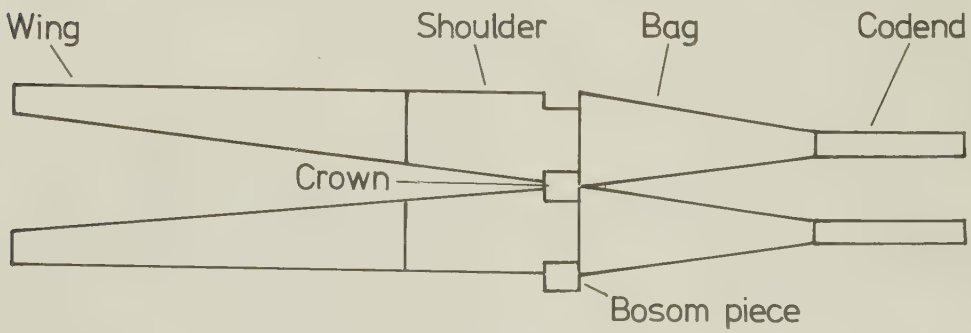


Figure 15. The net sections of a traditional seine-net.

Figure 16 shows the way a seine-net is rigged. The length of the sweeps is varied to suit prevailing conditions. Usually the groundrope is a fairly heavy rope weighted with lead rings. For working on rough ground it may be replaced with a wire groundrope with light spherical bobbins (usually plastic) on the bosom (middle) section and small rubber discs on the wing sections. The amount of rope used each side of the net may be up to twelve coils, each 120 fm (220 m) long, joined end to end.

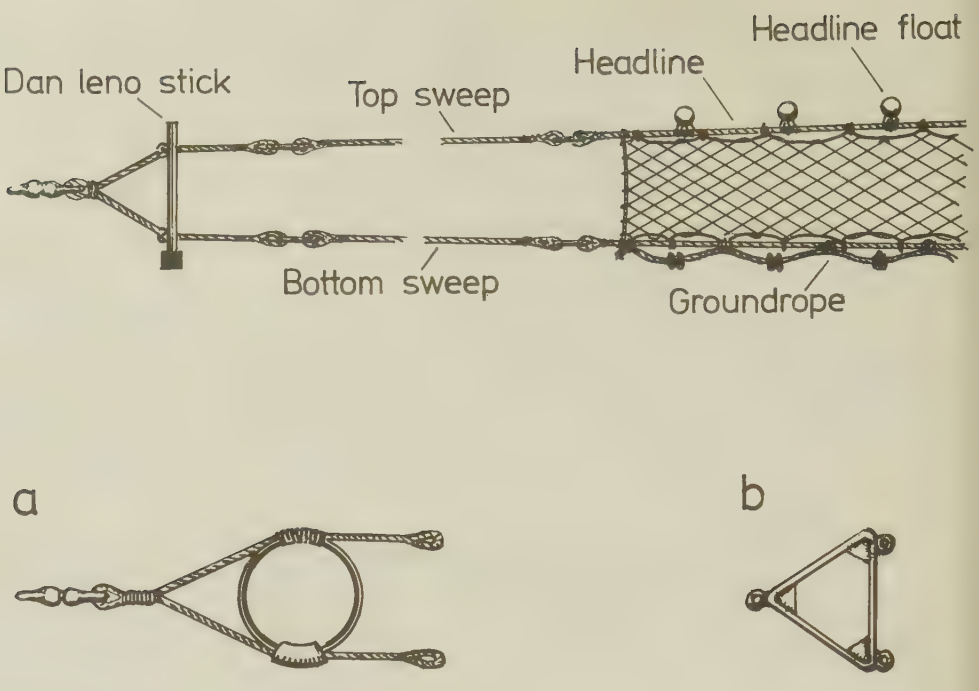


Figure 16. The rigging of a seine-net and alternative dan lenos - a) dan leno hoop; b) dan leno triangle.

Seine-net boats range in size up to about 25 m (82 ft) in length. Special rope hauling and coiling machinery is installed on deck and most modern seiners have hydraulically-operated articulated power blocks for hauling the net.

Shooting and Hauling the Gear

When the fish are located the vessel steams some distance away, depending on ground and sea conditions and extent of the concentration of fish.A marker buoy with flag, called a dan, attached to the free end of the first rope is then dropped over the side. The vessel then steams towards one side of where the fish have been located, paying out rope as it steams. When the vessel has passed the fish it moves across to shoot the net behind the fish (relative to the dan). The vessel then heads back to the dan, paying out the other length of ropes. By the time the gear is set, the dan picked up and that end of the first rope retrived, nearly all the length of rope each side is lying on the sea bed.

With the vessel maintaining sufficient way to be just going ahead, both ropes are hauled simultaneously, slowly at first, the ropes herding fish towards the path of the net as they close. As hauling proceeds the net slowly starts to move towards the vessel. When the ropes are about half way closed, as seen from the vessel, hauling speed is increased and the net begins to chivvy fish just in front of it whilst the ropes continue to herd more fish inwards. When the ropes are seen to be nearly closed they are then fast hauled and the net overtakes fish herded into its path. Fast hauling continues until the net is up to the vessel. This method of seine-netting is often called "Fly dragging". In Anchor Seining the marker buoy is anchored, and when the vessel returns to it after setting the gear the vessel is made fast to the anchor rope, which then holds the vessel against the pull of the gear whilst it is being hauled.

Purse-Seining

Purse-seining is a method of capturing fish that are known to aggregate into large dense shoals near the surface, eg herring, by surrounding the shoal with a deep curtain of netting supported at the surface by floats and weighted at the bottom, and then pursing the net (ie closing it) under the shoal by heaving on a wire which runs from the vessel, through rings hung from the bottom edge of the net, and back to the vessel (Fig. 17).

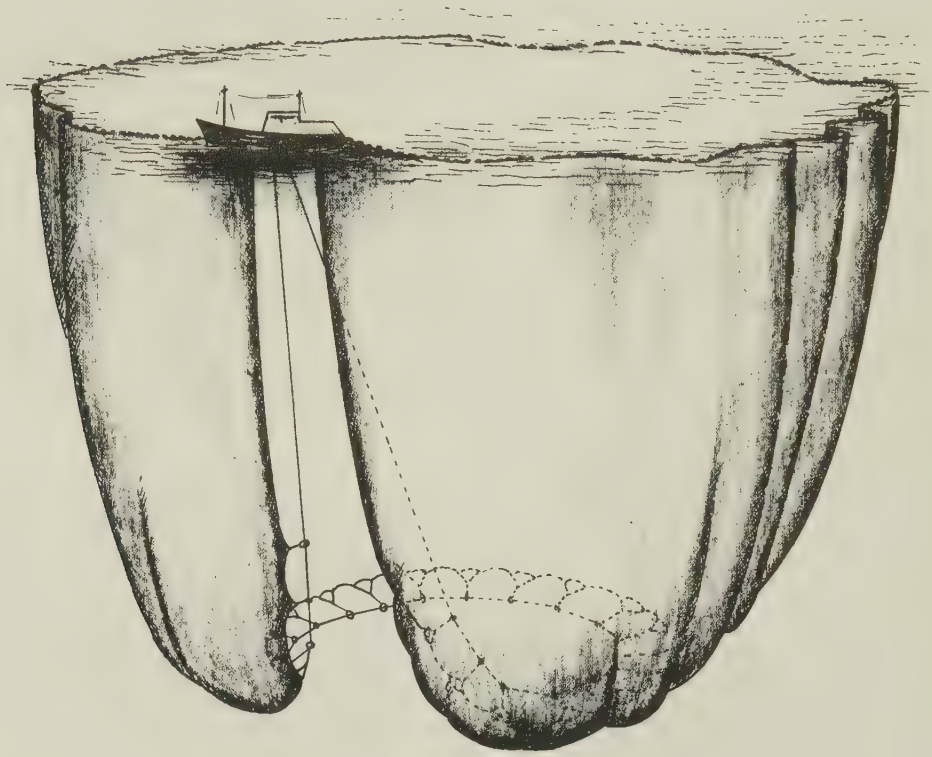


Figure 17. Purse-seine - early stage of pursing the net.

Purse-Seining Gear

The nets are made of large sections of netting, usually nylon, joined together and mounted to a headline, sole-rope and gables (side ropes) (Fig. 18). They may be up to 400 fm (730 m) long and over 100 fm (180 m) deep. It is important that the net sinks quickly when it is shot, and depending on the size of the net, up to five thousand lead weights each approximately 110 grammes (4 oz), threaded on to light lines, are attached along the sole-rope. To support this weight and the weight of the net, over a thousand floats, threaded on float lines, may be required on the headline. The floats are usually egg-shaped and made of cellular plastic.

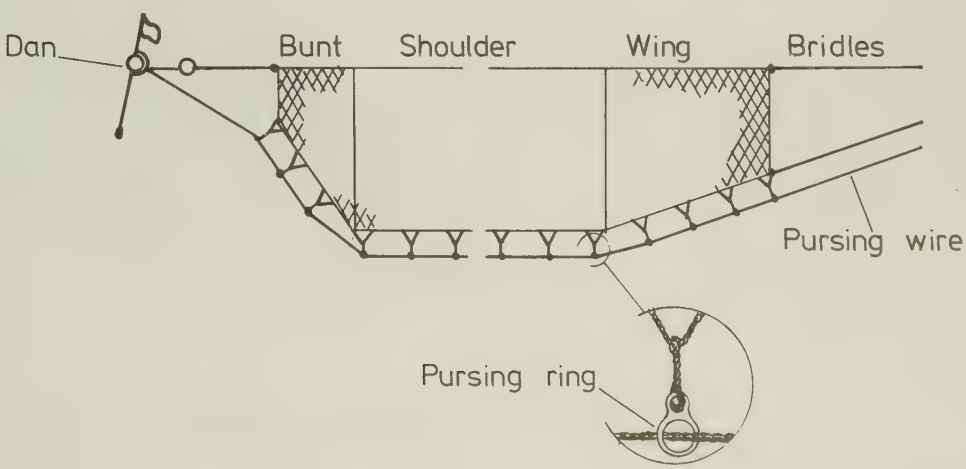


Figure 18. The principal net sections and ropes of a purse-seine.

The pursing rings hang 1 to 2 fm (2-4 m) below the sole-rope. On typical purse-seines there are between 40 and 50 pursing rings. There are various types of rings, some with a spring-loaded sliding ferrule so that the ring may be opened and unclipped from the pursing wire as they come to hand during hauling of the net, others with a spring loaded gate for the same purpose. They are usually made of hardened stainless steel.

Top bridles of length up to 50 fm (91 m) may be used one at each end of the net. The bunt end of the pursing wire is held up by two or three buoys whilst the net is being shot, in order to facilitate easy retrieval of that end of the pursing wire and the marker dan as soon as the net has been set.

Purse-seiners are usually purpose-built vessels provided with sufficient deck space at the stern on which to stack the net. Near to the net arena a hydraulically-operated power block is installed for hauling the net. On the fore deck a winch is installed for hauling the pursing wire. Advanced electronic equipment is provided for searching out shoals of fish, assessing the size and movement of these, and for keeping in touch with the selected shoal whilst surrounding it with the purse-seine.

Operating the Purse-Seine

When the purse-seine is put aboard it is stowed with the floats on the port side and the sole-rope on the starboard side (for clockwise shooting of the gear). In order to keep the pursing rings together clear of netting, and to ensure that they go away in the right order when the gear is shot, they are hung in order on a shooting bar positioned on the ship's side near to the net. Sufficient length of pursing wire is then run off the winch to allow its end to be passed through the rings on the shooting bar and then to connect it to the dan in readiness for shooting the gear.

Once the decision to fish on a shoal has been made, very careful attention must be paid to its depth, speed and direction of movement, and to the strength and direction of tide, current and wind, if the fish are not to escape before the net is pursed. The vessel then moves to the starting position, the dan is dropped over the side and the bridle with pursing wire allowed to run out followed by netting as the vessel moves round the shoal. The pursing wire takes pursing rings with it as the net pulls each one in turn off the shooting bar (Fig. 19).

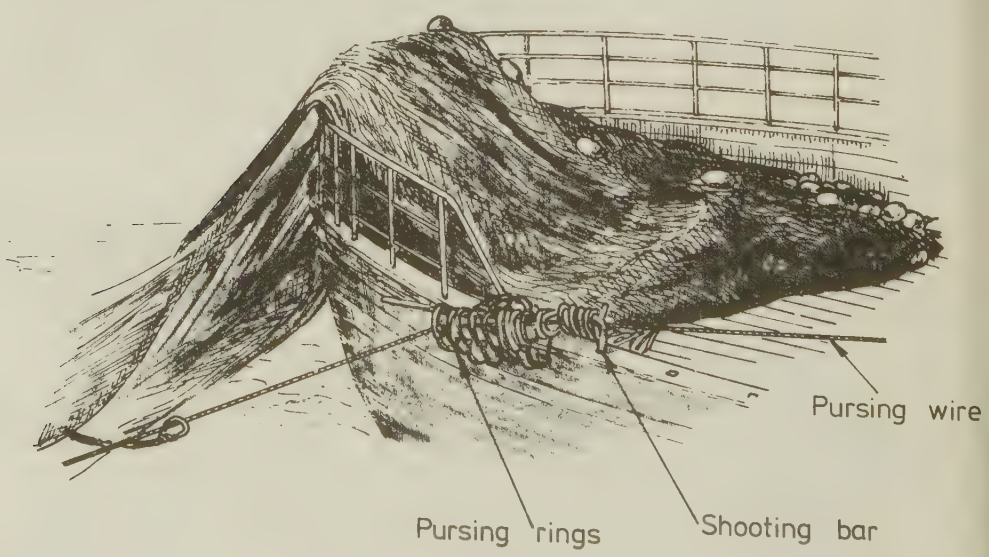


Figure 19. Shooting the purse-seine.

When all the net has been shot and the dan, buoys and the ends of the bunt bridle and pursing wire have been taken back on board and that end of the pursing wire made fast at the gallows, pursing of the net commences without delay. When the pursing rings are secure at the gallows and all slack wing netting is pulled in, the headline at the bunt is hooked up to a fore-boom. As the power block hauls in netting, each pursing ring in turn is unclipped from the purse wire and reclipped to a taut wire which guides the ring aft as it is pulled by the netting. It is then unclipped from the taut wire to allow it to be hauled with netting over the power block (Fig. 20). Hauling and stacking the net continues until the catch is concentrated close to the ship. Fish can then be lifted out of the net with a lifting net called a brailer, operated from a derrick, or fish and water are pumped out by a fish pump. When all the fish are on board the rest of the net is hauled and stacked and the gear made ready to shoot again.

Figure 20. Hauling the purse-seine.

Ring-Netting

A ring-net is another encircling net used mainly to catch herring when they come off the bottom at night and aggregate in tight shoals. They are particularly suited for working in relatively shallow waters near to the coast and in sea lochs. It was extensively used in the Scottish west coast herring fisheries, but since the introduction of the less arduous method of pair-trawling in recent years, ring-netting has been declining.

The Ring-Net

The net (Fig. 21) is usually made of nylon and is similar in shape to a purse-seine but smaller, with a bunt in the middle to hold the catch. Mesh sizes range from about 40 mm in the top section of the bunt to 70 mm in the deepening and 100 mm in the wings. Up to 500 solid plastic or cork floats are used on the headline and as many as 400 lead weights are distributed along the sole-rope. Below the net two messenger ropes are attached to the sole-rope at intervals by strops, 4-6 m long, called stoppers. When hauling the gear the messengers are taken to the winch to facilitate hauling the weighted sole-rope. Each end of the net is connected to the sweep by a bridle extending from the ends of the headline and sole-rope.

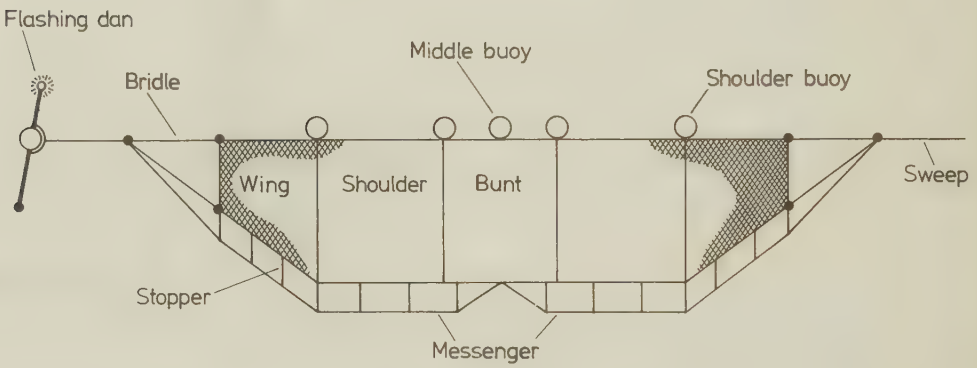


Figure 21. The net sections and ropes of a ring-net.

Ring-net boats range in size from 12.2 m (40 ft) to 18.3 m (60 ft) and work in pairs, each vessel carrying a net and gear and taking turns to shoot its net or assist the partner vessel. They are usually heavily fendered along one side with old car tyres for protection against impact when they come together during fishing operations.

Operating the Ring-Net

Figure 22 shows the ring-net gear ready for fishing on the two boats. The net to be fished (a) is shown stowed with the headline, fore bridles and flashing dan (known as a "winkie") at the stern, the sole-rope and messenger at the port quarter, the aft bridles and sweep coiled close by and the leading end of the sweep led through the fair lead and to hand at the ring-net winch.

On the partner vessel (b), the bulk of fore sweep is coiled on the hatch cover and made fast to the midship bollards near its leading end. The leading end is coiled on deck ready to pass to the first vessel after the net has been shot. The other end is led aft down the starboard side and round the back of the wheelhouse to midships on the port side.

When a suitable shoal is located and both vessels are ready, the first vessel will drop its winkie over the side and proceed round one side of the shoal, paying out bridles and net. The partner vessel picks up the winkie and connects the bridles to its sweep and then moves round the other side of the shoal towing the sweep from the midship bollards (Fig. 23a).

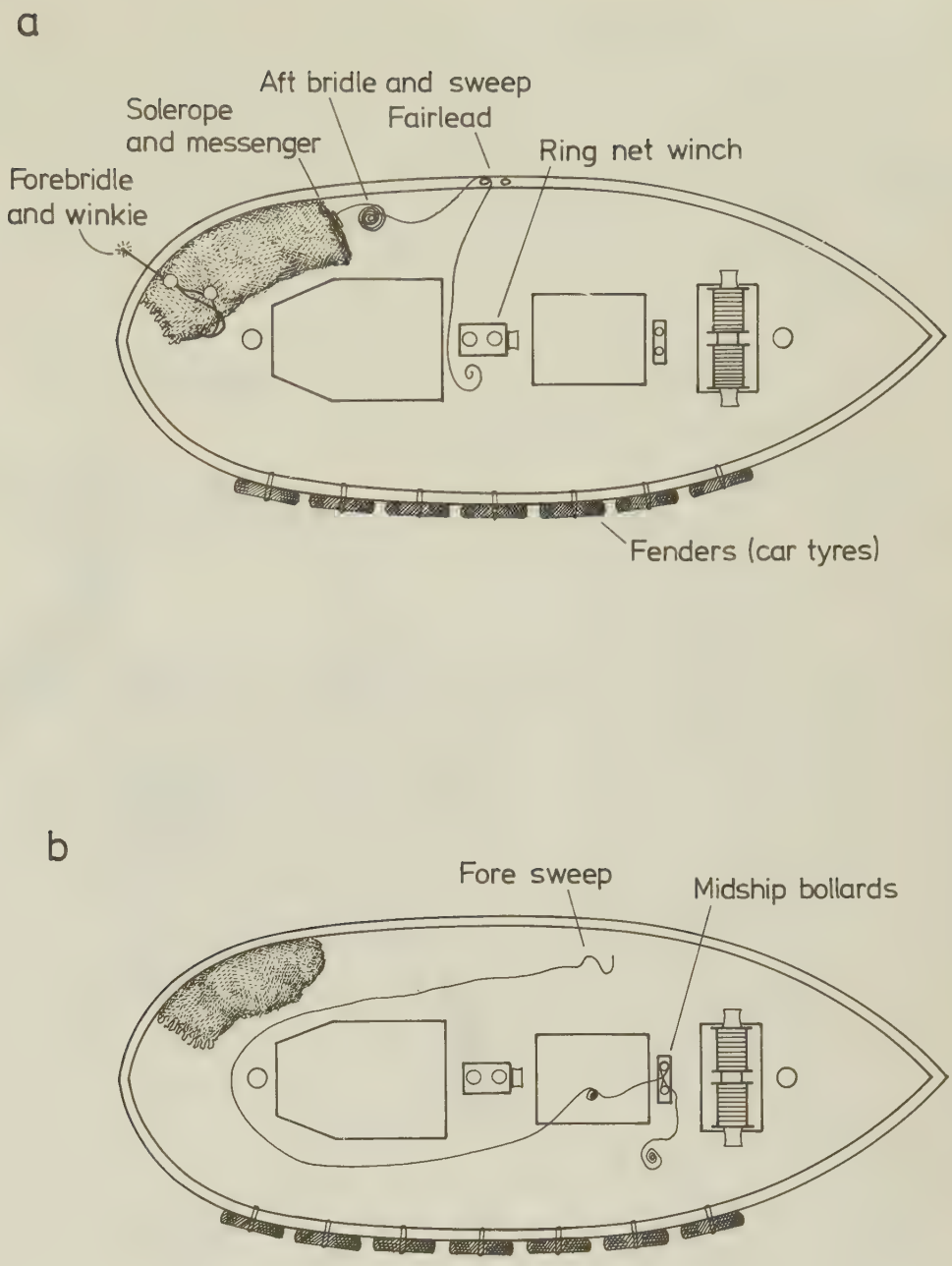


Figure 22. a) the ring-net and ropes of a ring-net.
b) the partner vessel ready to assist.

When the two vessels come together at the end of shooting operations (Fig. 23b), the leading end of the sweep on the partner vessel is passed over to the first vessel and led through the fair lead to the ring-net winch. Most of the partner crew then jump aboard the first vessel to assist with hauling the net. Usually these operations are carried out so that the vessels come together on the shore side of the shoal, taking account of wind and tide, so that when hauling the gear the net is hauled towards the shore. The bottom ropes are hauled faster than the top ropes in order to pull the bottom of the net under the shoal.

During hauling the assisting vessel holds the other vessel broad side away from the net until sufficient net is hauled to bring the catch to the side (Fig. 23c). It then moves to the opposite side of the net to assist in holding up the net, which otherwise might sink below the surface owing to the weight of the catch and allow many fish to escape (Fig. 23d). The fish are then brailed out and conveyed to the fish hold.

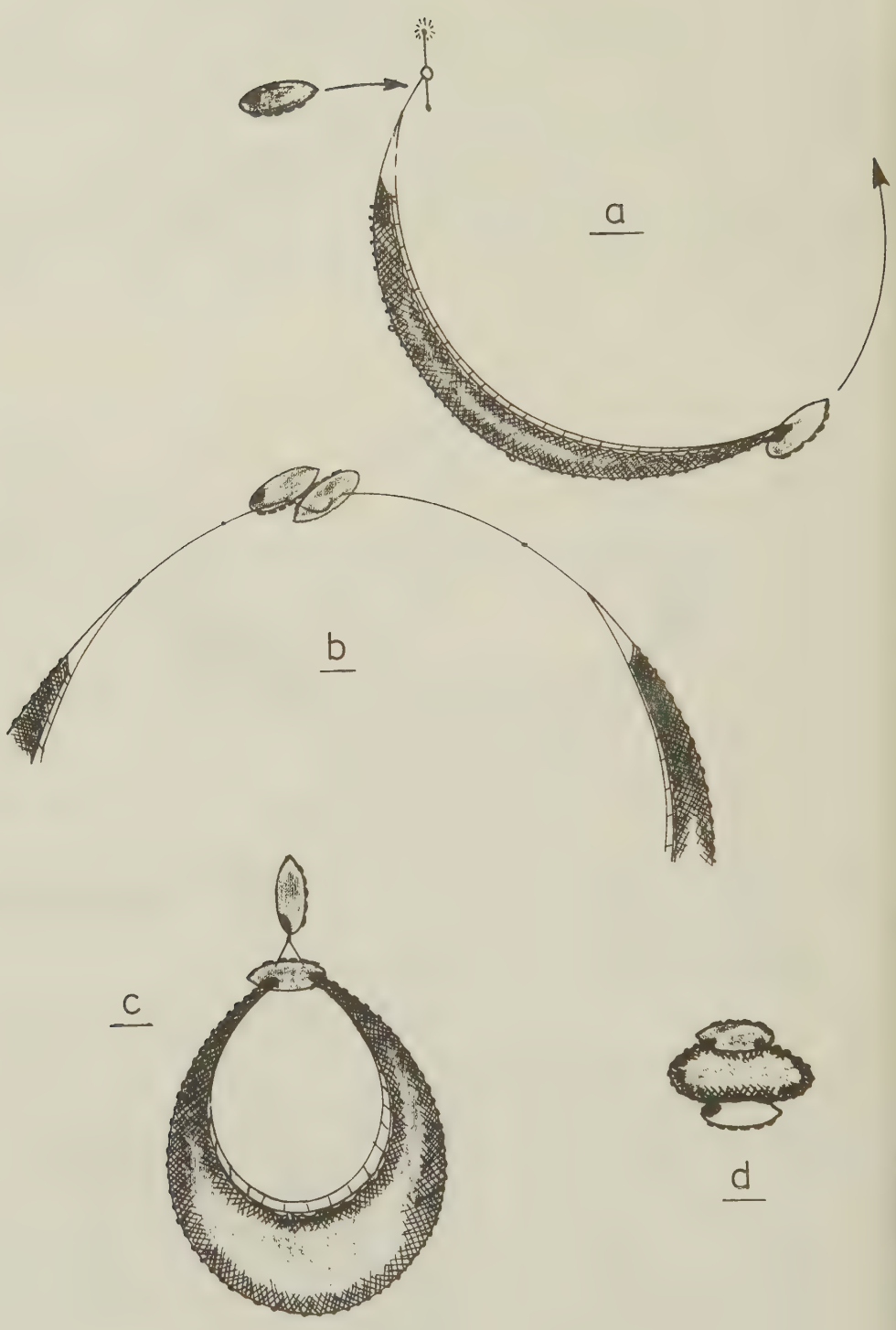


Figure 23. a) the ring-net being shot and the partner vessel approaching the dan; b) the two vessels come together to transfer the partner's sweep to the first vessel: c) hauling the net; d) both vessels supporting the catch until it is brailed from the net.

Drift-Netting

Drift-netting is one of the oldest fishing methods for catching fish that spend part of their adult life in the upper layers of the sea. For many generations of fishermen it was the principal method of catching herring. Although today only one or two Scottish boats operate drift-nets for herring seasonally, this method being almost entirely superseded by more efficient and less arduous methods, eg purse-seining and pair-trawling, drift-netting is part of the saga of the herring and is the back cloth of today's herring scene.

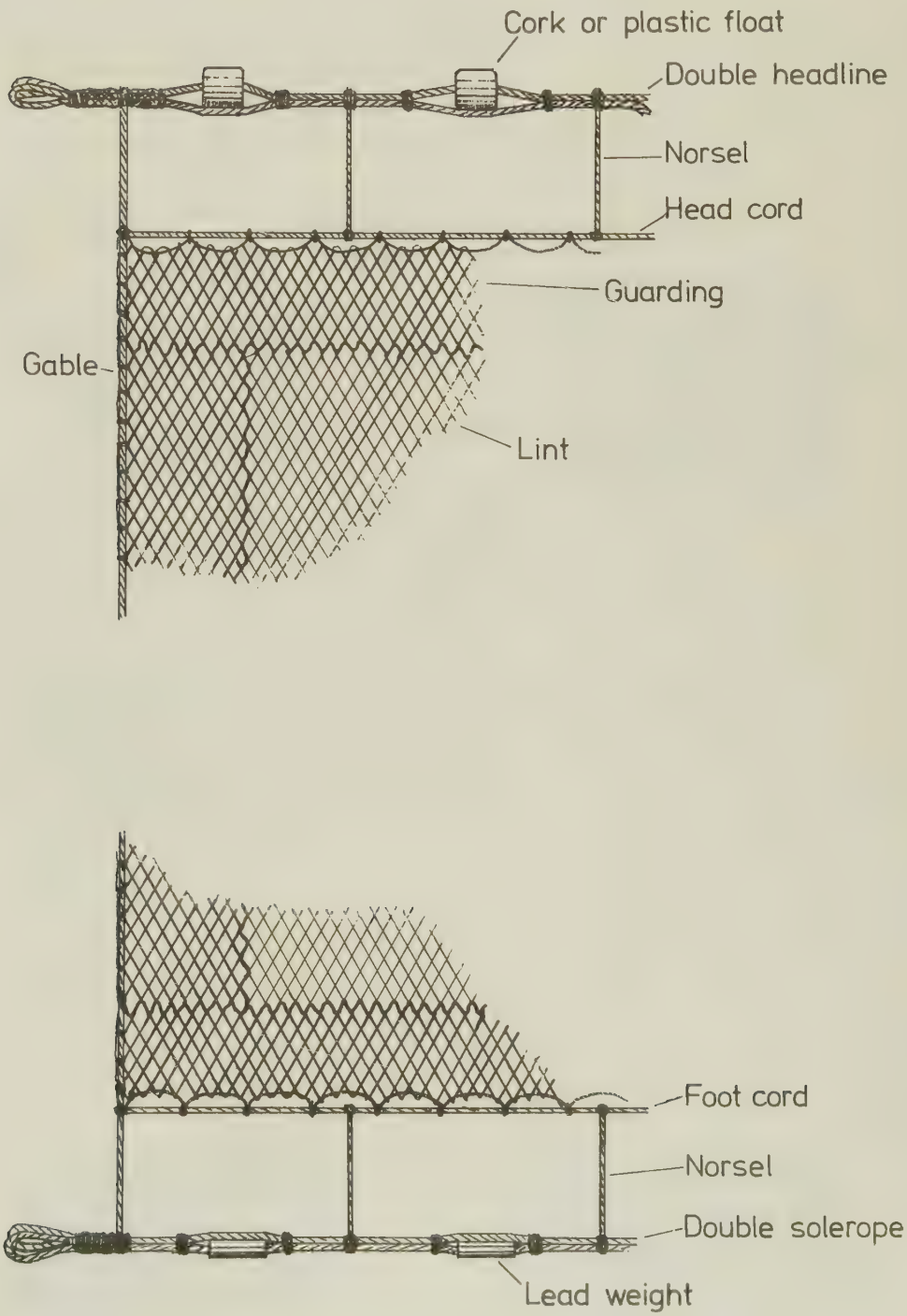


Figure 24. Top and bottom corners of a drift-net.

The Drift-Net

The drift-net (Fig. 24) consists of a curtain of lightweight netting with a border of stronger netting called guarding, its edges trimmed with soft cord, a headline carrying small floats (sometimes joined throughout its length to a second rope of opposite lay to prevent kinking), separated from the top of the net by short cords called norsels at regular intervals throughout its length and the bottom similarly attached to a sole-rope lightly weighted with lead. The size of drift-nets for herring is about 35 m long by about 15 m deep. The mesh size is chosen to allow the heads of marketable size herring to pass through and become enmeshed by their gills.

Fishing Drift-Nets

The nets are fished in fleets of up to 100 nets joined end to end per boat. The fleet is supported at the surface by buoys, with the length of buoy line adjusted to suit the required fishing depth. The sole-rope of each net is connected to a fairly heavy rope messenger by short strops called stoppers (Fig. 25).

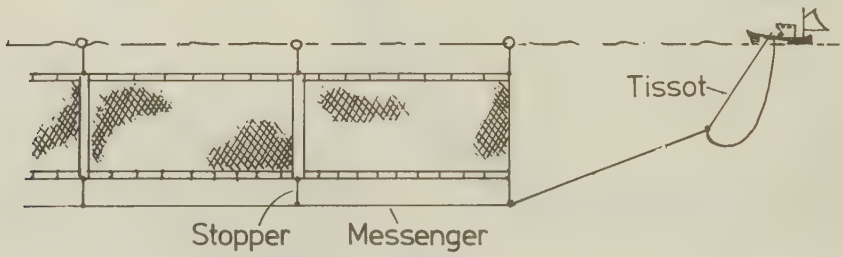


Figure 25. A drifter lying to a fleet of drift-nets.

At the commencement of shooting operations the vessel, with its mizzen sail hoist, turns down wind. With the nets already joined and with buoys and stoppers attached, the nets are shot one after the other. At the same time the messenger rope is paid out and each succeeding stopper secured to it as they come to hand. When the last net is shot, sufficient messenger rope is paid out to allow the drifter to swing round and lie bows to the nets. A rope or chain called a tissot may then be made fast to the messenger to take the strain and save chafing of the messenger against the side of the boat. The drifter will then lie for three or four hours before starting to haul the nets. As the nets come aboard the stoppers are detached from the messenger and the nets shaken violently to remove the catch.

Potting and Creeling

Pots and creels are small traps that are baited with fresh or salted fish and set on the sea bed in coastal waters to catch crabs, lobsters and, to a much lesser extent, Norway lobsters (scampi).

Pots

Pots may be inkwell shaped - Cornish pot (Fig. 26) or barrel shaped - French pot (Fig. 27). Traditionally, Cornish pots were made of withies and French pots of wooden hoops and laths. Galvanised wire netting may be used to cover an iron frame, eg Dutch pots (Fig. 28). These materials are still used but recently pots moulded entirely from plastic material have been successfully introduced. Pots are fished with the entry for the animals uppermost.

Creels

Creels are constructed with an entrance through one or both sides or through the ends. The Scottish creel (Fig. 29) consists of a wood or metal bowed framework fixed to a slatted base ballasted with a flat stone and covered with netting. Where entrances are required the netting is cut and then mended to form funnels into the creel. A laced slit in the netting facilitates baiting and removal of the catch.

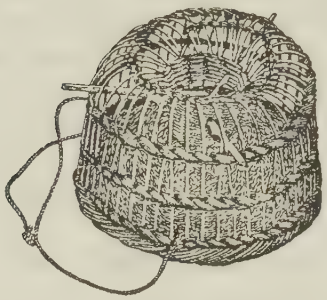


Figure 26. Cornish pot.

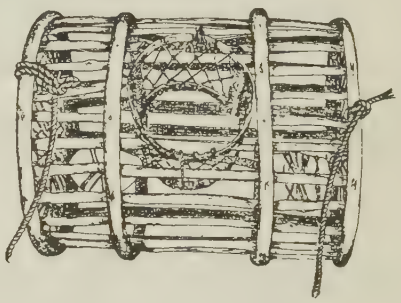


Figure 27. French pot.

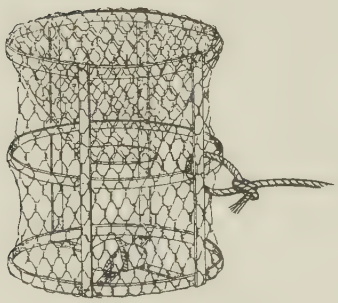


Figure 28. Dutch pot.

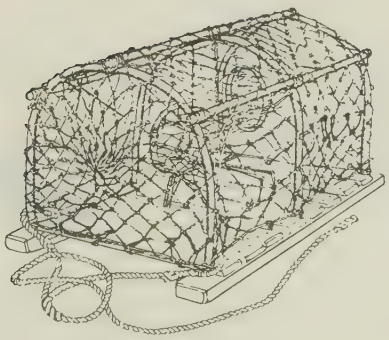


Figure 29. Scottish creel.

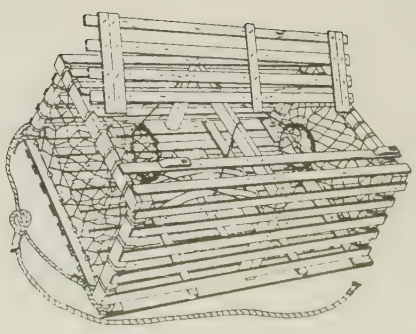


Figure 30. Gourdon creel.

A more advanced type of Scottish creel is the parlour creel which has two compartments. One compartment has an entry from the outside and holds the bait. Entry into the second compartment is through a funnel in the dividing net partition. In trying to escape from the first compartment the animal tends to take the easier route into the second compartment. This type of creel is useful if the creels frequently have to be left unattended for two or three days.

In certain areas along the east coast, eg the Gourdon area, where crabs predominate in the catches, the more robustly constructed wood slatted Gourdon creel (Fig. 30) that only employs netting at the ends for the funnels is preferred.

Fishing Creels and Pots

Creel fishing is prosecuted mainly from small boats of length up to about 15 m (50 ft). The wheelhouse is usually well forward to provide the maximum space aft for stacking and handling the creels. A power operated capstan for hauling the creels is installed at the hauling station near the ship's side.

The creels or pots may be fished singly or in strings. The general arrangement of a string of creels is shown in Figure 31. The backrope is made up of sections of rope called pot lines. The length of each pot line varies according to local conditions and water depth and is such that the number of creels off the bottom at any time during hauling does not exceed hauling capability. When a creel is fished singly no additional sinker or anchor is used, the creel being sufficiently ballasted to hold it in position on the sea bed. A light rope is attached for hauling, with a small float at the other end to mark its position at the surface.

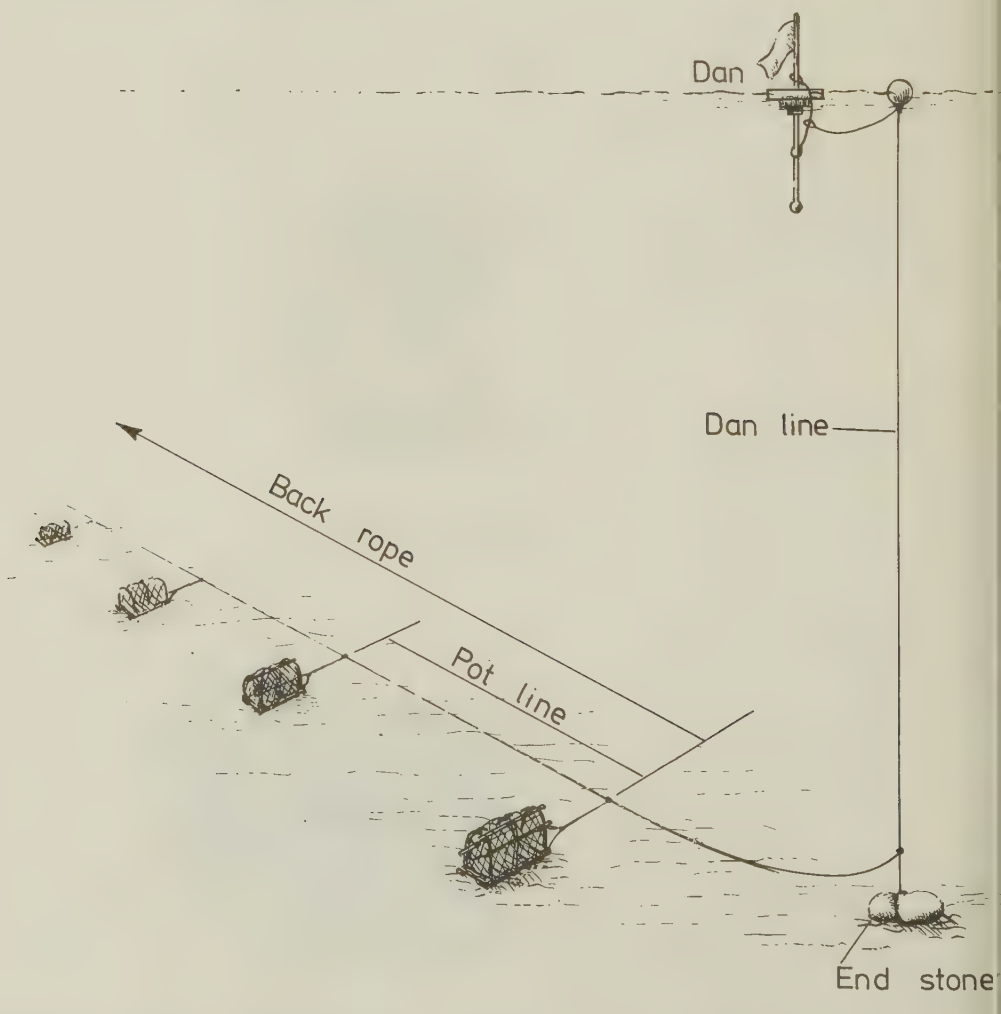


Figure 31. A string of pots.

Dredging for Scallops and Queens

Figure 32 shows a typical dredge for catching scallops and queens. The dredge is made of steel and consists of a ruggedly constructed triangular frame with the sides and centre members extended rearwards and bent, and to which is bolted a tooth-bearing bar 1.2 m to 2.4 m (4 ft to 8 ft) long at an angle such that the teeth rake the surface of the sea bed when the dredge is towed. A mat made of linked steel rings called the belly is secured behind the tooth bar, A cover made of heavy netting is joined to the sides and back of the belly and carried forward to the base of the frame to form the bag in which the catch is retained. A recent innovation is the employment of shock-absorbing springs to connect the tooth bar to the frame.

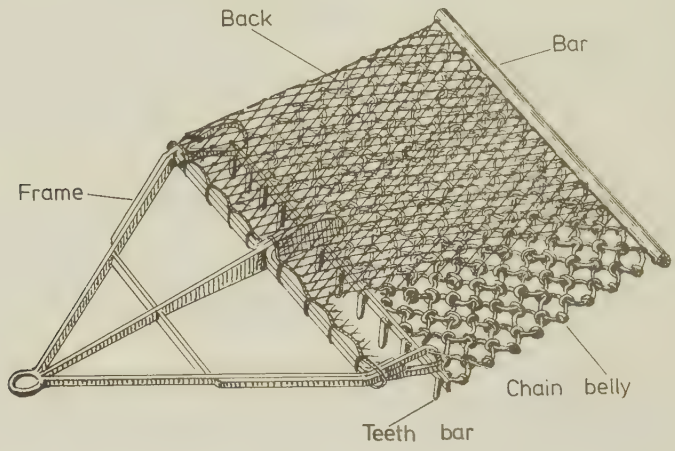


Figure 32. A dredge for scallops and queens.

Reversible type dredges are sometimes used in deep water. They are fitted with two opposite pointing tooth bars so that the dredge will fish either way up.

Another type of dredge is the queen dredge designed specifically for queen fishing. It consists of a low profile oblong steel box frame with runners incorporated at each end. A chain bag is attached behind the frame. It has no tooth bar and no triangular fore-frame. Towing chains are used instead.

Dredges are worked by vessels up to about 24 m (78 ft) in length, and depending on their size and power may tow up to three or four dredges connected to a towing bar at each side (Fig. 33). They are launched over the side and the vessel travels at full speed until sufficient warp is paid out. The dredges are then towed for an hour or two before they are hauled. The catch is then tipped out on to the deck and scallops and queens sorted into sacks ready for the market.

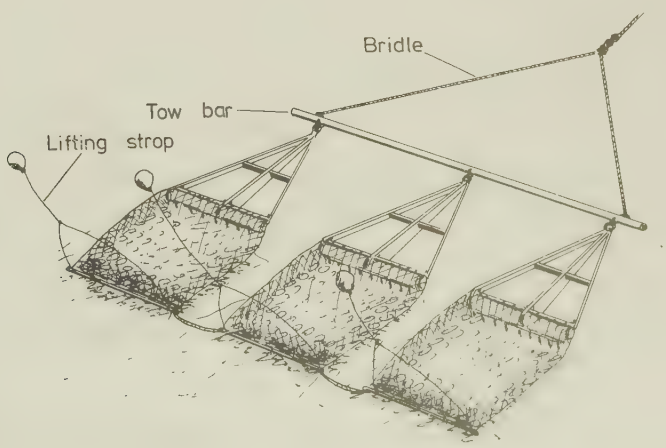


Figure 33. Towing three dredges in line together.

Long Lines

In long line fishing a number of long lines each with baited hooks on branch lines called snoods spaced at intervals along their length are connected end to end and placed on or just off the sea bed with an anchor and marker buoy at each end (Figs. 34 and 35). There are two classes of this gear, great lines and small lines. The main difference lies in the sizes of the components.

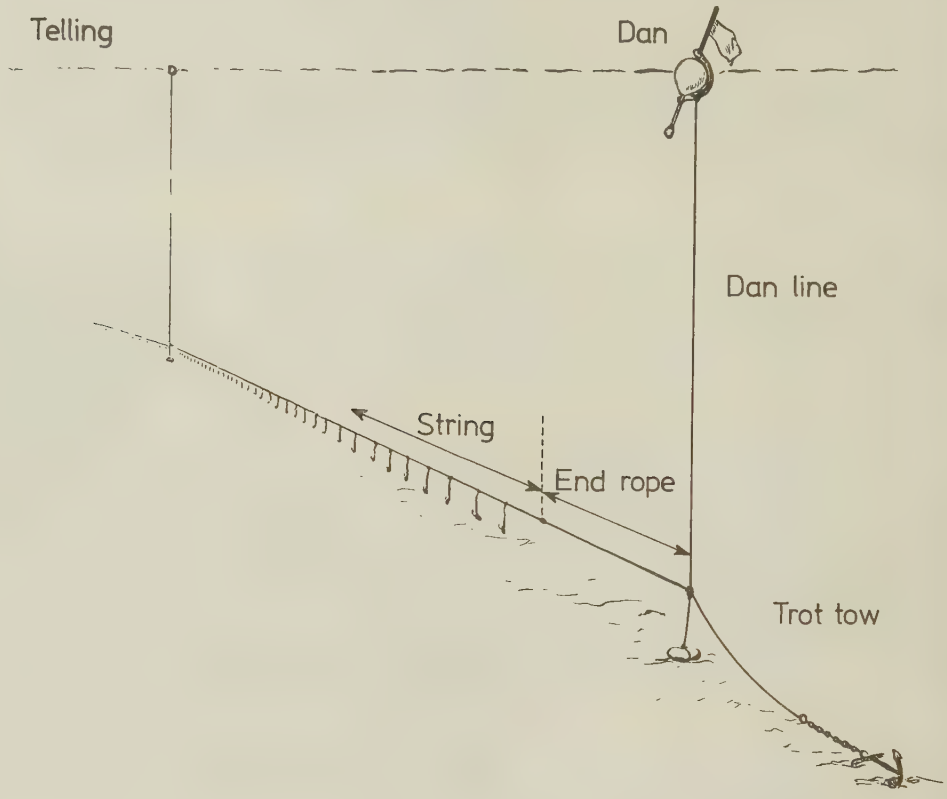


Figure 34. A long line.

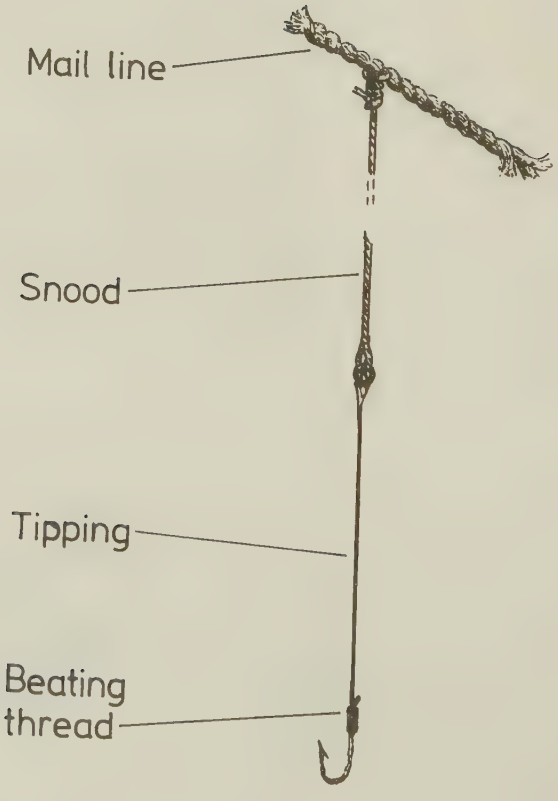


Figure 35. Attachment of hook to mainline.

Great Lines

A great line, as the name suggests, consists of heavier long lines and is used by vessels which operate in distant waters around Greenland, Iceland, the Norwegian coast, Faroes and the west of the Hebrides, fishing for halibut, cod, ling, tusk and skate. A great line may consist of up to 30 long lines and a typical long line is made up of six strings, each string consisting of a main-line 60 fm (110 m) long, and 16 branch lines or snoods 1½ fm (2.7 m) long with a hook at the end of each.

When vessels were more open and the gear prone to becoming tangled by the wash of seawater breaking over the ship's side, the hooks were baited and each line joined to the next as the gear was being shot, each line having been carefully coiled into a basket and the point of each hook stuck into a semi-circle of cork round the basket's edge in successive order beforehand. On more modern vessels which are better designed to provide a drier shooting station, pre-baited lines may be shot from wooden tubs.

The baskets or tubs are placed in sequence near the shooting station, which may be at the stern or side. As one line is being shot the next line is moved up and its leading end joined to the tail end of the preceding line. Additional anchors and dans called tellings may be used to mark changes in the course of the lines.

The lines are hauled with the aid of a mechanical hauling capstan and the catch removed as the fish come over the side, the larger fish first being gaffed. As soon as each line is hauled it is carried away to be sorted out and carefully coiled back into the basket in preparation for shooting again.

The traditional method of great lining is arduous and often dangerous. Today the lot of the line fisherman is being considerably improved by the introduction of recently developed on-board baiting machines and conveyer systems for handling the lines.

Small Lines

Small lines are much lighter than great lines and are fished from small boats operating on grounds near their home port. Usually the hooks are baited ashore, often by the womenfolk of the family. Special wooden trays, open at one end and deeper at the other end, are used to hold the lines. Lines are coiled into the deep end and, as the hooks come to hand, they are baited with either mussel, lugworm or pieces of fish, and then carefully laid side by side and row upon row in the shallow part of the tray, starting at the back and working towards the open end. Each row is separated by newspaper or grass cuttings.

Before shooting the gear, the trays of lines are placed in series near and leading to a metal chute at the vessel's stern. At the commencement of shooting the gear, the first anchor and dan are lowered over the side. As the vessel slowly steams along, the line and baited hooks run out over the metal chute. Finally the end anchor and dan are set.

The lines are left for several hours, during which time the crew may fish with hand lines before starting to haul. After hauling the boat returns to port to land the catch.

Hand Lines

Hand line fishing is mainly conducted from small boats, often on a part-time basis to supplement other income. Most of the gear is made up by the fisherman and all that is basically required are a few hooks or lures and some weight attached to the end of sufficient length of line.

The hooks may be tied to casts at the end of short metal booms, the dandy (Fig. 36), and baited with fresh or salt herring, squid, mussel or lugworm and fished just off the bottom whilst the boat drifts. Most fish found inshore may be caught by this method.

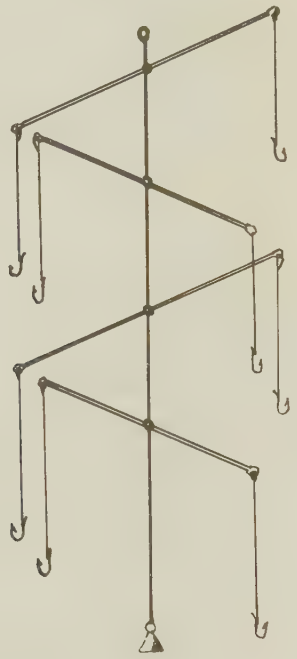


Figure 36. A dandy.

When there are concentrations of cod and whiting or ling the ripper is very effective (Fig. 37). It is made from a short length of brass pipe, filled with lead and three holes drilled through, the one at the top to take the attachment ring and the other two each to take a short cast to the ends of which are tied the hooks. No bait is used. It is lowered to within a foot or two of the bottom and jerked up and down to attract and foul-hook the fish. The amount of line out may need to be adjusted if the fish are off the bottom. The ripper may be used singly or in pairs, eg the sprool (Fig. 38).

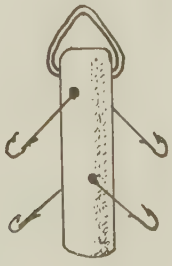


Figure 37. A ripper.

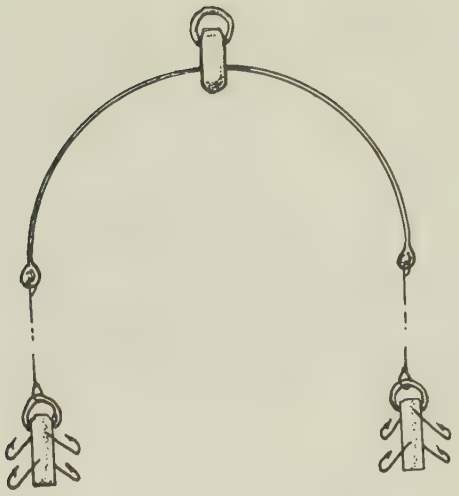


Figure 38. A sprool.

When mackerel are inshore they are readily caught by towing a weighted cast of hooks dressed with coloured feathers (Fig. 39). This method will sometimes catch whiting.

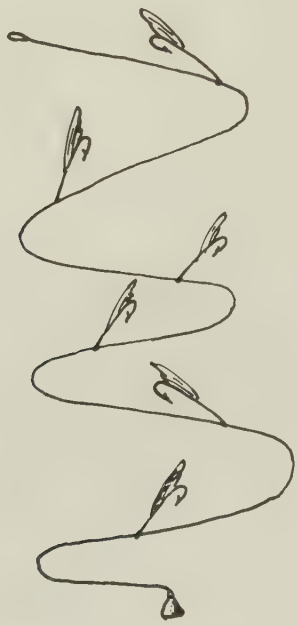


Figure 39. A set of feathers.

Although landings of hand line-caught fish are small they often command a good price because the fish are usually fresher and of better appearance than most fish caught by other methods.

Set Nets

Set nets are walls of netting 1.5 m –3 m (5 ft - 10 ft) deep and up to 30-40 fathoms long that rely on the meshes to trap fish individually. They are usually fished in relatively shallow inshore water where fish are known to be moving, although they have been used for catching cod in water depths up to 60 fathoms. Small solid floats, usually made of plastic and either cylindrical or egg-shaped, are attached to the headline and lead weights are evenly distributed along the sole-rope. Alternatively a lead-cored sole-rope may be used. They may be fished with the sole-rope hard onto the sea bed, or just off the sea bed, in mid-water, or with the head-line at the surface, according to the species sought, with suitable moorings to hold them at the required depth (Fig. 40). They may be used singly or a number joined end to end.

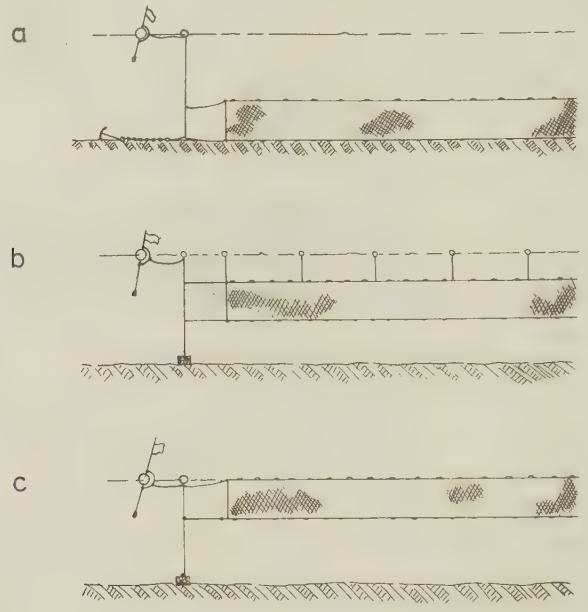


Figure 40. Set nets - a) on the bottom; b) mid-water; c) at the surface.

The mechanisms by which the nets catch the fish is either by gilling them or by entanglement, depending on size of the meshes and the hang of the netting. For gill nets the mesh size is chosen to allow only the head of the fish to pass through and then be caught at the back of the gills. The netting is attached to the headline and sole-rope such that when they are fished the shape of the meshes is almost square. For tangle nets a larger mesh size is used and the netting is more loosely hung, making the netting generally more baggy than in gill nets so that, as the fish twists and turns when trying to escape, it becomes entangled in the meshes.

A more advanced type of set net is the trammel net. It is constructed of three sheets of netting hung together. The inner sheet of netting, the lint, is loosely hung between two outer sheets of larger mesh netting called armouring (Fig. 41). When the fish strikes the net and then tries to escape through it, the small-meshed netting is carried through the larger mesh and the fish becomes trapped in the pocket so formed.

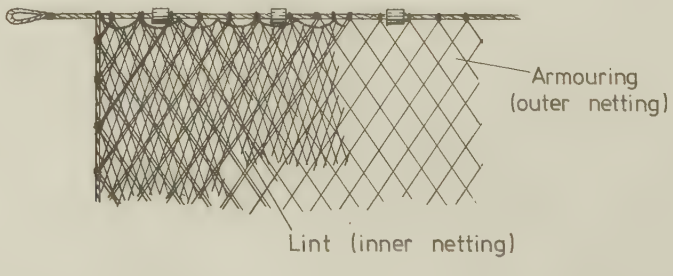


Figure 41. Part of a trammel net.

Bag-Nets and Stake-Nets

Bag-nets and stake-nets are the commonest types of gear used to trap salmon in Scottish coastal waters beyond defined estuarine limits. Both types of nets are designed to take advantage of the habit of salmon to swim close to the surface when they are following the coast line on their way to fresh water to spawn.

The Bag-Net

A complete bag-net consists of two principal parts, the trap and the leader (Figs. 42 and 43). The trap is approximately 13.5 m (44 ft) broad and 4.6 m (15 ft) deep at the land end and tapers through three compartments, cleek, doubling and fish court, to about 3 m wide and 2.5 m deep at the head. Each compartment is partitioned by net walls called scales. All three compartments have a net floor and a net roof covers the doubling and fish court. Passage for the fish to the fish court is through the wide entrance to the cleek, through

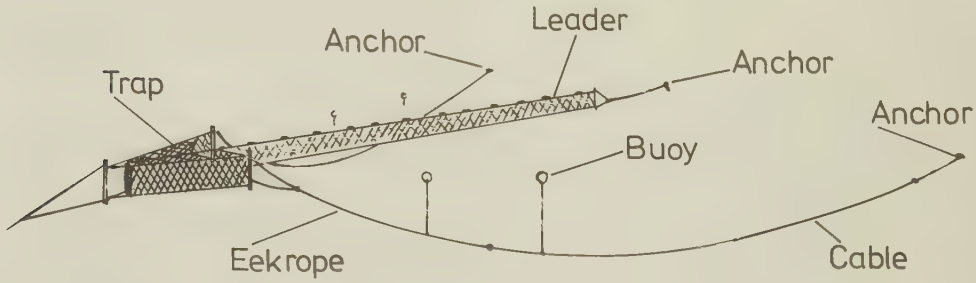


Figure 42. Bag-net and moorings.

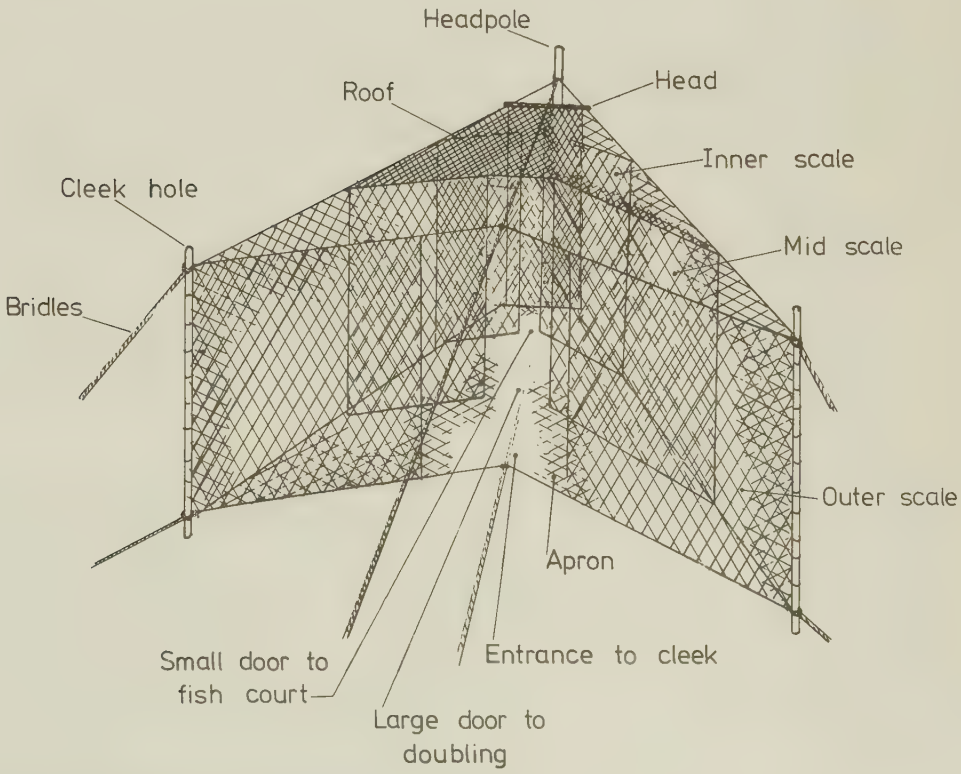


Figure 43. Trap of a bag-net (leader not shown).

the large door into the doubling and then through the small door. Three poles, head pole and two cleek poles hold the trap upright and provide some rigidity. The leader is a wall of netting extending from the entrance of the trap to the shore. The land end is secured to a pole which is held by bridles to a rock fastening or to an anchor.

Fishing the Bag-Net

Bag-nets are normally fished on rocky coasts where they will not ebb-dry at low tide. They may be set singly or a number may be connected to form a line of nets stretching seaward from the shore. They are floated and set to fish just below the sea surface where they are often subjected to broken water and strong tides and therefore require substantial moorings to hold them in place and in fishing trim. Three sets of moorings are required. One set heads seaward from the headpole and the other two angle outwards from the cleek poles towards the shore. Each set of moorings consists of an eke rope several fathoms long with which to adjust the set of the trap, up to 40 fathoms (73 m) of wire rope and 10-20 fathoms (18-37 m) of heavy chain ending with a heavy anchor. Three or four large plastic floats are attached to each mooring at intervals to provide some buoyancy.

When the returning salmon encounter the leader they instinctively turn away from the shore and follow the netting until they are led to the entrance where they take the easier route into the cleek. Once inside, the easiest way out is through the large door into the doubling and then through the small door into the fish court.

The catch is usually removed at high or low water when the tide is at its slackest. The boat approaches the side of the fish court from which the tide is flowing. The top ropes are detached from the head pole to allow the bottom of the fish court to be pulled to the surface. The crew then bring the boat across the net by pulling on the meshes of the roof and apron together to isolate the fish in the pocket of netting formed by the flowing tide. The fish are then clubbed, a slit in the side of the net unlaced and the fish removed. The slit is then replaced and the headropes secured to the head pole to put the net in fishing order again.

Stake-Nets

Stake-nets include fly-nets and jumper-nets. They are similar in design and operation to bag-nets, but whereas bag-nets are floated over rocky sea beds and require substantial moorings to hold them, stake-nets are fished on sandy beaches where the tide recedes sufficiently to leave them dry and where stakes for their support can be erected in the sand without need for moorings. These nets are usually smaller than bag-nets and the cleek has neither a bottom nor a cover. Up to a dozen stakes with guy ropes may be used to support the trap. The leader of a fly-net is held upright by up to 35 stakes but the leader of a jumper-net is held at each end only such that it is free to rise and fall with the tide.

Fishing Stake-Nets

Fly-nets, like bag-nets, may be fished singly or a number may be set in line depending on the gradient of the beach. Jumper-nets are nearly always fished singly and on steeper gradients. The catch is removed after high water on an ebbing tide and before the water level in the fish court has fallen to about 1 metre. In the case of fly-nets the fisherman walks along the sole-rope of the leader which at the farthest end may be up to 3 m (about 10 ft) above the sea bed. When he reaches the first trap he moves onto the roof of the fish court, unlaces the access slit and removes the fish with a large hand held net. The fish are clubbed and then the free end of a holding rope is threaded through their gills and the fish cast into the sea before proceeding to the next trap in the line. On his return the fish are collected and dragged to the shore. On steeper gradients where jumper-nets are used, and where the depth of water decreases more quickly as the tide recedes, the fisherman can wade into the trap and remove the fish through the small door in the fish court.

Beach-Seining

A beach-seine (Fig. 44) is a small single panel surround net consisting of a bag in the middle to hold the catch, a shoulder section each side and a wing section at each end. The top of the net is attached to a headline floated with small corks or plastic floats and the bottom is attached to a lightly weighted sole-rope. Each wing-end is connected by short strops to a dan leno stick and each dan leno is connected to a hauling rope.

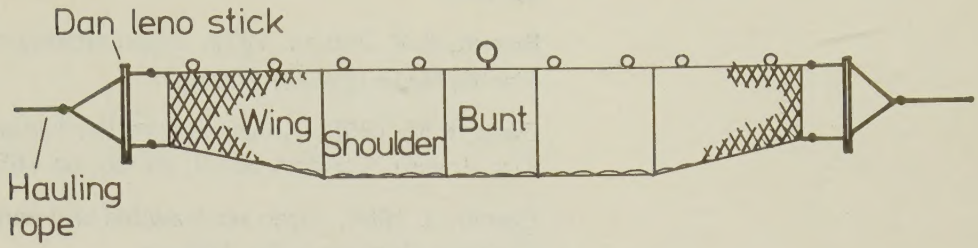


Figure 44. Beach-seine.

These nets may be operated from small rowing boats or more often from small flat-bottomed powered boats, assisted by a shore party, for catching salmon and sea trout inside estuarine limits and sometimes at coastal sites where freshwater discharges into the sea. The hauling rope at the boat end of the net (Fig. 45) is coiled down at the stern of the boat, then the net is stacked over it and part of the up-stream hauling rope is coiled on top of the net. One of the shore party then takes up the end of the up-stream hauling rope and the net is shot from the boat as it is propelled diagonally across the river. The boat then turns and heads down-stream for a short distance before heading back to the shore. Meanwhile the fisherman with the up-stream hauling rope has been walking slowly down to the point where the boat lands. Here both ropes are hauled simultaneously by hand or by winch to pull the net ashore. When the net is dried up the catch is removed and the gear made ready again at the stern of the boat. The boat and shore party then return to the starting point for the next sweep.

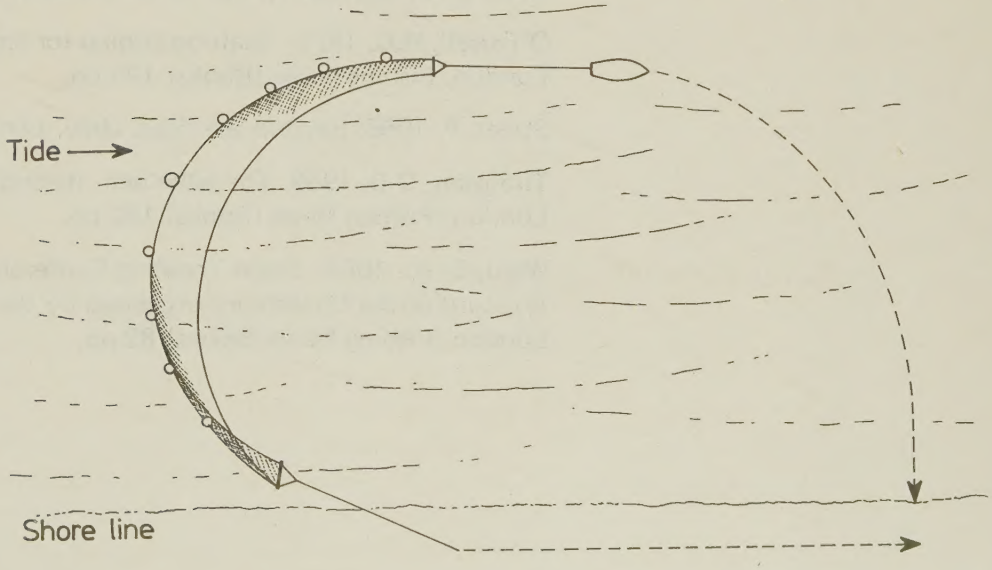


Figure 45. Fishing the beach-seine.

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